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Case Study: How Sustainable Is Your Project?

A Sustainability Impact Assessment Tool for Innovation Projects

Master's Thesis
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Abstract

Companies are increasingly undergoing digital transformations and integrating sustainability into their operations. Disruptions are occurring across industries, and digitalization and sustainability are driving companies to adopt new ways of operating. Although both topics have sparked a vast amount of research respectively, there is less research on the combination of digitalization and sustainability. In this thesis, I studied a large Finnish multinational company and sustainability operationalization within its internal accelerator. The overall objective of the study was twofold. First, it sought to research the implementation of sustainability into decision-making and sustainability assessment. Second, the aim was to develop a sustainability impact assessment (SIA) tool with relevant criteria for the accelerator's innovation projects.

The research problem was addressed by asking the following research questions: *How can sustainability be implemented into decision-making? How can the sustainability impact of innovation projects be assessed? What are the most important criteria to take into consideration regarding the sustainability impact of innovation projects?* To answer the research questions, the study was conducted as a case study. Within the case company, the internal accelerator acted as the case, and three innovation projects were examined in further detail. The research data was collected through semi-structured and unstructured interviews with the company's sustainability managers, accelerator managers, product owners and project members. The data analysis followed an inductive strategy and used thematic analysis to understand and structure the data into themes, sub-themes and codes.

This study concluded that an SIA tool is a practical means to operationalize sustainability and implement it into decision-making. The chosen criteria within the SIA tool should be aligned with the organization's definition of sustainability as well as its sustainability vision and targets. Evaluating the sustainability impact of innovation projects can integrate sustainability into the projects and narrow the gap between organizational sustainability targets and employees' daily activities. Nonetheless, an SIA tool is only one approach to guide decision-making and operationalize sustainability within organizations. Thus, different approaches, tools and activities are needed to advance sustainability.

Keywords sustainability, digitalization; sustainability impact assessment, decision-making

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Yritykset läpikäyvät yhä enemmän digitaalisia transformaatioita sekä integroivat kestävän kehityksen periaatteita toimintaansa. Murroksia esiintyy kaikilla toimialoilla, ja digitalisaatio sekä kestävä kehitys ajavat yrityksiä omaksumaan uudenlaisia toimintatapoja. Vaikka molemmat aiheet ovat herättäneet valtavasti tutkimusta, digitalisaation ja kestävän kehityksen yhdistelmän tutkiminen on toistaiseksi jäänyt taka-alalle. Tässä gradututkielmassa tutkin suurta suomalaista monikansallista yritystä ja kestävän kehityksen toiminnallistamista sen sisäisessä kiihdyttämössä. Tutkielmalla oli kaksi päätavoitetta. Ensinnäkin tutkielman tarkoituksena oli tutkia kestävän kehityksen toteuttamista yrityksen päätöksenteossa. Toisena tavoitteena oli luoda kestävyysvaikutusten arviointityökalu, jonka kriteeristö vastaisi kiihdyttämön innovaatioprojektien tarpeisiin.

Tutkimusongelmaa lähestyttiin esittämällä seuraavat kysymykset: *Miten kestävä kehitys voidaan toteuttaa päätöksenteossa? Miten innovaatioprojektien kestävyysvaikutuksia voidaan arvioida? Mitkä ovat tärkeimmät kriteerit, jotka on otettava huomioon innovaatioprojektien kestävyysvaikutuksia arvioitaessa?* Tutkielma toteutettiin tapaustutkimuksena vastatakseen tutkimuskysymyksiin. Yrityksen sisäinen kiidyttämö toimi tutkimuksen tapauksena, ja yrityksen kolmea innovaatioprojektia tutkittiin tarkemmin. Tutkimusaineisto kerättiin tekemällä puolistrukturoituja ja strukturoimattomia haastatteluja yrityksen kestävän kehityksen johtajien, kiihdyttämön johtajien, tuoteomistajien sekä projektijäsenten kanssa. Aineiston analyysi noudatti induktiivista strategiaa. Analyysitapana käytettiin temaattista analyysiä, joka mahdollisti aineiston ymmärtämisen ja jäsentämisen teemoihin, alateemoihiin sekä koodeihin.

Tutkimustulokset osoittavat, että kestävyysvaikutusten arviointi on keino toiminnallistaa kestävää kehitystä ja sisältää se yrityksen päätöksentekoon. Kestävyysvaikutusten arviointityökalun kriteeristön tulisi olla yhdenmukainen organisaation kestävän kehityksen määritelmän, vision sekä tavoitteiden kanssa. Innovaatioprojektien kestävyysvaikutusten arviointi voi osaltaan integroida kestävää kehitystä yrityksen projekteihin ja kaventaa kuilua organisaation tavoitteiden ja työntekijöiden päivittäisen toiminnan välillä. Tästä huolimatta kestävyysvaikutusten arviointi on vain yksi tapa ohjata yrityksen päätöksentekoa ja toiminnallistaa kestävää kehitystä. Sen vuoksi kestävän kehityksen edistämiseksi yrityksissä tarvitaan erilaisia lähestymistapoja, työkaluja ja toimintoja.

Avainsanat kestävä kehitys, digitalisaatio, kestävyysvaikutusten arviointi, päätöksenteko

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1. INTRODUCTION

Disruptions are occurring in various industries and forcing established companies to transform their ways of doing business to maintain and gain a competitive advantage in the shifting markets. Digitalization and acceleration of technologies are megatrends, driving change and enabling new business models (Dobbs, Manyika & Woetzel, 2015). Furthermore, sustainability issues pose far-reaching challenges globally, increasing the demand and necessity for significant alterations in how countries, companies, and citizens act (UNDP, n.d.).

The number of companies undergoing digital transformations and integrating sustainability into their core values is increasing. Kiron and Unruh (2018) state that both digitalization and sustainability have gained traction as influential market forces in the business world, resulting in large volumes of research conducted on the topics separately. Nonetheless, research on sustainability, coupled with digitalization, is still widely lacking (Kiron & Unruh, 2018).

This thesis explores relevant academic and societal discussions regarding digital transformations, the concept of sustainability, sustainability assessment, and decision-making. The academic objective of the study is to contribute to the discourses by combining existing literature with collected primary data and offering insight into the operationalization of sustainability. Ultimately, the goal of the study is to create a sustainability impact assessment (SIA) tool for organizations that guides decision-makers in evaluating projects' sustainability impact before the projects' kick-off or in the early phases. The benefits of conducting an SIA include sustainability operationalization, risk avoidance, and the consideration of sustainability from the start of a project. It ensures pre-emptive attention to any potential sustainability impact rather than mere reporting and assessment after the fact. Additionally, it increases knowledge on sustainability matters amongst employees and integrates sustainability targets into their daily work (Waas, Hugé, Block, Wright, Benitez-Capistros & Verbruggen, 2014).

This study is conducted as a case study on an established Finnish multinational company, experiencing a digital transformation. The case company operates in traditionally high-emitting industries, such as energy and manufacturing, and aims to be a sustainability

forerunner within these fields. These attributes make a compelling case study as the gathered data contributes to the existing literature on how sustainability is operationalized within large, established companies in the context of digital transformations.

Narrowing the study to creating an SIA tool for projects can be justified because companies use projects to realize their strategies (Poon & Silvius, 2019). Poon and Silvius (2019) explain that project management is increasingly considered a vital enabler of organizations' shift to sustainability. As there is a wide variety of project types, this study will be limited to innovation projects within the accelerator of the company. In the case company, innovation projects are characterized as digital, customer- and user-centric projects that are led with agile project management and service design methods. The projects are executed collaboratively with relevant internal and external stakeholders. The project idea and solution's value are always assessed before allowing the project to progress to the next phase. If the project idea shows the potential to create value for the company and customer, it continues to the second transformation phase and is further developed and finally deployed. The process within the case company's acceleration program is similar to ones in external accelerators. Kliger (2017) notes that the objectives of accelerators are to test ideas rapidly and have a shorter time-to-market for new digital solutions. Ultimately, if decision-makers give the green light to the solutions or products, they enter the market and growth phase (Kliger, 2017).

Numerous potential projects are evaluated against defined criteria before they are developed into innovation projects within the case company. The case company considers sustainability vital as it is embedded in its mission and communicated extensively both internally and externally. However, the sustainability impact of innovation projects is not explicitly assessed, even if the company's sustainability vision strategically guides decision-making. With an SIA tool, the company could assure or, at a minimum, check whether the innovation projects are aligned with the company vision and then take the appropriate course of action if they are not.

Therefore, the research questions of the study are the following:

1. *How can sustainability be implemented into the decision-making process?*
2. *How can the sustainability impact of innovation projects be assessed?*

3. *What are the most important criteria to take into consideration regarding the sustainability impact of innovation projects?*

Although every company does not have an internal accelerator program, many traditional, established companies are undergoing digital transformations, implementing agile project management methods, and doing projects in collaboration with customers and other stakeholders (Yang, Kher & Lyons, 2018). Operationalizing sustainability is challenging, partially due to the different and multifaceted understandings of sustainability, its solutions, and the wickedness of the problems (Brønn & Brønn, 2018). A holistic understanding is needed (Borland, 2009), as well as integration into decision-making (Waas et al., 2014). Therefore, I believe that the results of this study can contribute to existing literature by providing empirical data and an in-depth look into a case company and sustainability operationalization. Finally, the SIA tool presented in this study can be adjusted to evaluate the sustainability impact of other types of research and development (R&D), innovation, or digital projects within companies interested in sustainability impact evaluation.

2. LITERATURE REVIEW

First, the literature review will present digital transformations and corporate accelerators for context. Subsequently, the variations and understandings of sustainability as a concept are discussed. The integration of sustainability within decision-making is then deliberated, after which different sustainability assessment frameworks and the challenges accompanying sustainability assessment are explored. The literature review concludes with a reflection on how the presented sustainability assessment frameworks relate to the SIA tool created for this study.

2.1. Digital transformations

Digital transformations can be defined as 'the use of technology to radically improve performance or reach of enterprises' (Westerman, Calméjane, Bonnet, Ferraris, & McAfee, 2011: 5). Companies need to increasingly embrace digitalization to succeed (Harvard Business Review Analytic Services, 2020) as digital transformations continue to disrupt markets (Kupp, Marval & Borchers, 2017). However, for digital transformations to be efficacious, companies need to do more than digitize their products and services or apply innovative technology; a crucial factor is renovating the whole company to leverage digitalization and novel technologies (Westerman et al., 2011). As companies face pressure to transform and strengthen their capabilities (Selig, Gasser & Baltes, 2018), they must reimagine their business models, processes and ways of working for business success (Westerman et al., 2011). Moreover, they need to embrace organizational transformation (Furr, Gaarlandt & Shipilov, 2019).

This trend has resulted in a growing number of large companies launching their own incubators and accelerators in the last decade (Kanbach & Stubner, 2016). Traditional accelerators are typically designed to help start-ups in the early phases of their journey by providing expertise, networking opportunities, mentorship, refinement of ideas, workshops, possibilities of funding, and prototyping support (Yang et al., 2018). On the other hand, corporate accelerators are often created to foster internal innovation or support start-ups relevant to the company's business (Becker & Gassmann, 2006; Selig et al., 2018). Accelerators take different forms and aim to bring established companies closer to start-ups by adopting the strengths start-ups possess, such as entrepreneurial spirit, flexibility, and

innovation (Kanbach & Stubner, 2016; Kupp et al., 2017). Increased competition from new players, partially due to digitalization, has gotten larger companies to recognize that it is easier to disrupt themselves than give others a chance (Kupp et al., 2017).

As markets and industries are transforming, all companies (emerging and incumbent) have the opportunity to position themselves in the way they desire. Every type of company has its strengths and weaknesses, which is why corporate accelerators strive to capture the best of both worlds by retaining the strengths of start-ups as well as established organizations (Kupp et al., 2017). Start-ups are more flexible and less bureaucratic (Selig et al., 2018), while established firms have the advantage of resources, access to market, credibility, and scalability (Kohler, 2016). Subsequently, regulators typically give incumbent companies preference, such as in large-scale novel technology diffusion, placing emerging companies in a less advantageous position (Carpenter, 2004).

The pace of digital transformations varies greatly, and many organizations find it challenging to embrace change or even comprehend how to change (Westerman et al., 2011; Pappas, Mikalef, Giannokas, Krogstie & Lekakos, 2018). Thus, adding sustainability to the mix makes it even more complicated. Digitalization for sustainable development is widely discussed, yet it is not easy to implement (Pappas et al., 2018). Companies are assuring the public that sustainability is a top priority as customers, partners, and other stakeholders are continually demanding it (Delai & Takahashi, 2011; Pappas et al., 2018). However, if organizations consider sustainability a crucial part of their strategy and transformation journey, they must operationalize it within their activities (Waas et al., 2014). The operationalization of strategy is necessary for sustainability transitions and digital transformations. Companies must align their activities and operating models according to their vision and strategy for successful digital transformations (Deloitte, 2020). Moreover, strategic sustainability entails coupling sustainability values with strategic organizational management, ensuring sustainability is operationalized both in strategies and practice (Borland, 2009).

In this study, the case company regards sustainability and digital transformation as fundamental components to its strategy. Therefore, an SIA tool for innovation projects is relevant to both the case company and the study.

2.2. Sustainability

Sustainability has become an important global issue (Olawumi & Chan, 2018). Solutions to wicked problems, such as global warming, the continuous growth of populations and income inequalities, loss of biodiversity, and natural resources degradation, are desperately needed (NRC, 2011; Olawumi & Chan, 2018). Sustainability is a megatrend that has evolved throughout the years (Lubin & Esty, 2010; Derqui, 2020) and sparked an increasing amount of research in recent years (Lange, Busch & Delgado-Ceballos, 2012; Olawumi & Chan, 2018). It comes with a sense of urgency, and yet, the question of how to take sustainability beyond buzzwords to action is still tricky to answer (Lange et al., 2012; Waas et al., 2014). The biggest problem industries need to tackle is translating management theory and operations to actions that advance sustainability (Khalili & Melaragno, 2011).

Business organizations are considered to be at the heart of the dilemma due to their massive influence on sustainable (or unsustainable) development and prevalence in social, environmental, and economic matters (Brønn & Brønn, 2018). However, conventional business models typically aim to maximize shareholder value and view sustainability more as a cost than a benefit (Whelan & Fink, 2016). Moreover, the value of economic sustainability has been heavily prioritized over environmental and social sustainability (Borland, 2009; Brønn & Brønn, 2018).

However, as sustainability becomes an increasingly important societal issue, the purpose of companies is evolving to create value for stakeholders rather than solely for shareholders (Eccles, Strine & Youmans, 2020). Corporations are realizing the need to have targets beyond financial ones (Lange et al., 2012). Consequently, sustainability reporting and assessment to manage and demonstrate sustainability actions have developed (Zimek & Baumgartner, 2020). The need has grown from mere stakeholder and risk management to implementing and integrating sustainability into organizations' daily activities (Epstein, 2008). Full implementation and integration require a systemic understanding of sustainability impact, assessment and operationalization (Epstein, 2008).

Sustainability reporting is becoming an increasingly standard practice to communicate how much a company cares about social and environmental issues and manages sustainability (Adams & Frost, 2008). The reports typically outline targets and key performance indicators,

sustainability initiatives, as well as future actions and goals (Gatti & Seele, 2014). However, the growth in sustainability reporting does not mean by default that firms are more committed to sustainability. It can also imply that companies recognize the importance of releasing sustainability reports for credibility and brand reasons (Gatti & Seele, 2014) and due to a 'business case rather than a moral stance' (Adams & Frost, 2008: 299). Nonetheless, improving sustainability performance requires focusing on actual sustainability impact (Halme, Rintamäki, Knudsen, Lankoski & Kuisma, 2020).

Subsequently, sustainability assessment is a mechanism that guides decision-makers to take actions leading to sustainable development (Waas et al., 2014; Zimek & Baumgartner, 2020). As this study is interested in understanding how the sustainability of innovation projects can be assessed and the criteria under which it is done, this topic will be discussed in further detail in the chapter *Sustainability Assessment.* However, before diving into how to assess sustainability, it is critical to grasp what is even meant by sustainability. Therefore, the next chapter will explore the various definitions, ambiguity of sustainability as a concept, and the complexity of the matter.

2.2.1. **Concept of sustainability**

Sustainability as a concept has varying definitions and can, therefore, be interpreted in many different ways (Pope, Annandale & Morrison-Saunders, 2004; Johnston, Everard, Santillo & Robèrt, 2007; Butler, Henderson & Raiborn, 2011; Hugé, Waas, Dahdouh-Guebas, Koedam & Block, 2013; White, 2013; Zimek & Baumgartner, 2020). Sustainable development is one of the most common understandings of sustainability, and the terms sustainability and sustainable development are often used interchangeably (Johnston et al., 2007; Aras & Crowther, 2009). The World Commission on Environment and Development (WCED) first defined sustainability in the Brundtland Report as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987). The Brundtland Report was groundbreaking at the time, as it linked large issues together, such as poverty alleviation and environmental development (Mebratu, 1998). However, the definition of sustainable development can also be interpreted in many ways, which critics view problematic (Mebratu, 1998). Albeit the fundamental notion of sustainability is rather clear-cut, 'a sustainable system is one which survives or persists' (Costanza & Patten, 1995: 193), it does not include necessary answers to complex

questions, such as ‘What system … persists? For how long? When do we assess whether the system … has persisted?’ (Costanza & Patten, 1995: 193). One could ask similar questions about the Brundtland definition: what are the needs of present generations that need to be met, and what are the needs of future generations (White, 2013)? Devuyst, Hens, De Lannoy and de Lannoy (2001: 9) aimed to create a more precise definition by defining sustainable development as ‘a societal project that aims to develop economic activities within the carrying capacity of the local ecosystem in such a way that the local population benefits as a whole, while preserving the well-being of future generations and people elsewhere’.

Still, there is a lack of consensus of what is meant by “development” in the concept of sustainable development. Johnston et al. (2007) argue that development can be interpreted to refer to economic growth, which then turns sustainable development into an oxymoron. Moreover, some definitions explicitly refer to economic development as, for instance, Epstein and Buhovac’s (2014: 23) definition: ‘sustainability has been defined as economic development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs’. Conversely, others view development to mean something different. Ariansen (1999) believes that with the addition of “development”, the concept of sustainability evolved to include morality as one of its layers while emphasizing the social aspect and longevity of the human race as a whole. Clearly, sustainability and sustainable development allow for diverse interpretations, creating disagreements on the terminology and definitions. Ironically, the loose interpretation of the concept is also one reason sustainability and sustainable development as concepts are universally accepted (Mebratu, 1998).

Costanza and Patten (1995) argue that what qualify as sustainability definitions are assumptions that one believes will contribute to sustainability from actions taken today. Thus, sustainability cannot be thoroughly analyzed nor meticulously measured until after some time has passed (Costanza & Patten, 1995). Sustainability is commonly portrayed as a journey and process instead of a goal in itself (Dahl, 2012), raising questions of the considered destination and whether it is the same for everyone (Lankoski, 2016). Since it is difficult to define such a complex concept, sustainability could perhaps be better understood when seen (White, 2013). As an example, the figure below is a visual representation of commonly used words in sustainability definitions.

Figure 1: Wordle cloud of the different definitions of sustainability (White, 2013)

As previously discussed, the objectives of sustainable development have been unifying at best and ambiguous at worst. Thus, operationalizing sustainability and the Brundtland Commission propositions to shape organizational decision-making has been challenging (Caiado, Leal Filho, Quelhas, de Mattos Nascimento & Ávila, 2018). Forming the United Nations (UN) Sustainable Development Goals (SDGs) was a step toward having globally collective, measurable goals and operationalizing sustainable development. The goals were embraced in 2015 by the UN member states and effective since 2016 (Caiado et al., 2018). The seventeen SDGs, which can be seen in Figure 2, aim to create economic growth and equality worldwide while caring for the environment (UN, n.d.). The SDGs establish a global strategy for sustainable development applicable to every nation and conform to the three pillars of sustainability: economic growth, social inclusivity, and environmental protection (Caiado et al., 2018).

Figure 2: The UN's Sustainable Development Goals (United Nations, n.d.)

Although the SDGs are a form of operationalizing sustainability, a remaining imperative step is 'the assessment, monitoring and tracking of SDGs' (Caiado et al., 2018: 1279). This study also aims to support operationalizing sustainability and assessing whether projects align with defined sustainability targets.

2.2.2. **Sustainability in a business context**

Sustainability is often portrayed as the overlapping part of three circles representing the economy, society, and environment (Pope et al., 2004; Connelly, 2007). Various representations build upon the same idea, such as the triple bottom line and the three P's (people, profit, and planet) (Elkington, 2018). These are formally accepted by numerous sustainability assessment frameworks and entities, such as the Global Reporting Initiative (GRI), US Environmental Protection Agency (EPA) and UN (NRC, 2011).

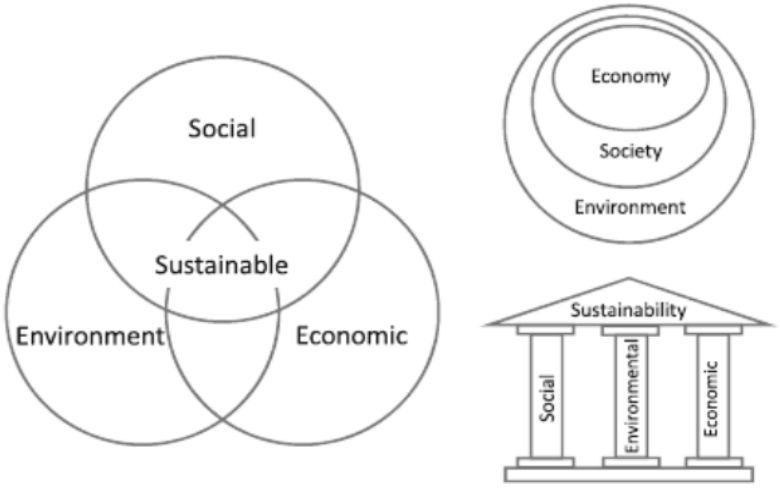

Figure 3: Representations of the triple bottom line approach (Purvis, Mao & Robinson, 2018)

Companies have been increasingly pressured to monitor and report social and environmental performance, which has led to mass adoption of the triple bottom line (Adams & Frost, 2008; Epstein, 2008; Delai & Takahashi, 2011). Embracing the triple bottom line approach implies that companies are just as dedicated to social and environmental interests as achieving financial goals. Hence, there are three bottom lines (profit, people, and planet) to meet, rather than one (Kenton, 2020). However, Elkington (2018), who coined the term "triple bottom line", criticizes how the concept has been used as an accounting instrument when the objective was to stimulate critical thinking regarding the existing economic systems and

direction they are heading. Furthermore, the three dimensions of people, planet and profit are generally not of equal importance to companies, and meeting profit targets still primarily describes how corporations operate (Borland, 2009; Brønn & Brønn, 2018; Elkington, 2018). Thus, companies often view sustainable development as financial growth that takes environmental and social elements into consideration (Aras & Crowther, 2009). Elkington (2018) argues that although countless annual triple bottom line reports are published, the unfolded data is not collected and combined in a manner that helps decision-makers and regulators realize and supervise the systemic impact of our collective actions better.

A mutual understanding of what sustainability means is lacking within a business context, and the concept is left for companies to interpret and define on their own (Johnston et al., 2007; Lankoski, 2016). Corporate sustainability research has had a relatively narrow focus. It has been limited to studying the importance of sustainability within an organization's targets and sustainability considerations in company practices (Lankoski, 2016). Hence, a large gap exists in research ignoring issues, such as the actual definitions and meanings of sustainability within a business context. Some benefits for loose definitions are the same in organizations as elsewhere, such as flexibility and wide acceptance of the concept, since sustainability relates strongly to values and large, manifold systems (Lankoski, 2016). This encourages open and dynamic discourse where various perspectives can be seen and brought together (Lankoski, 2016). However, this often causes the term to be routinely misused, misunderstood, and misapplied in business environments, and therefore, inhibits sustainability transitions from happening on a systematic level (DesJardins, 2016; Lankoski, 2016).

Since sustainability is complex and often associated with other wicked problems, the solutions and discussions must be multidisciplinary and take into account systems rather than individual problems. Thus, having a shared understanding of sustainability and its meaning is imperative to align different actors (Lankoski, 2016). Connelly (2007: 260) adds that sustainable development will remain undermined as a policy target as long as it is viewed as 'everything and nothing'. Efforts of advancing environmental protection and social justice are inhibited if the people seeking them do not grasp the dynamics and inherent contradictions between the intended goals (Connelly, 2007).

Different understandings of the concept can also hinder sustainability transitions within organizations. For instance, even employees within companies may not have a mutual understanding of the concept and, therefore, not have the same goal towards which they are working. Companies may also select sustainability goals that are effortless for them to achieve and consequently, not make an effort to change their business-as-usual activities or strive for more stringent and necessary sustainability targets. Communication of such sustainability measures may be greenwashing and misleading (Lankoski, 2016).

2.2.3. **Conclusion: the definition of sustainability**

To properly develop sustainability on any level, strategically and operationally, there needs to be a common consensus on the meaning of sustainability (Lankoski, 2016). As mentioned, this is not always an easy task considering that the definitions relating to sustainability and sustainable development can be vague and varied. Table 1 demonstrates this by presenting several definitions from many sources, as well as listing some of the open questions that arose when writing the literature review for this thesis.

Table 1: Different definitions related to sustainability

Definitions	**Source of definition**	**Open questions**
Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs	WCED, 1987	What are the needs of the present that should be met? What are the needs of the future that should to be met?
A sustainable system is one which survives or persists.	Costanza and Patten, 1995	How long does a system need to survive or persist to be considered sustainable?
The triple bottom line is a sustainability framework that examines a company's social, environment [sic], and economic impact.	Elkington, 2018	Are all three levels of impact equally important? What elements are examined and measured?
Sustainable 1. capable of being sustained 2. a) of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged b) of or relating to a lifestyle involving the use of sustainable methods	Merriam-Webster Online Dictionary, n.d. a	Is the criterion for sustainable practice that the resource is not fully depleted or permanently damaged?

There are numerous studies on defining sustainable development, and it is possible to find hundreds of definitions (Zimek & Baumgartner, 2020). This illustrates how difficult it is to reach a mutual agreement on sustainability, let alone assess its impact. As the objective of this thesis is to create an SIA tool in the context of a case study, the used sustainability definition in this thesis is based on the definition used by the case company. The case company has defined sustainability through the triple bottom line and considers sustainability to encompass 'social, environmental and economic sustainability'. Thus, this study will use Elkington's approach and assess sustainability by examining the environmental, social and economic sustainability impacts.

The idea of sustainability is understandable on a conceptual level. However, organizations find it challenging to turn it into tangible measures with financial feasibility (Khalili, 2011). Now that we have determined what is meant by sustainability in this study, the next chapter will explore implementing sustainability within decision-making to operationalize sustainability.

2.3. Sustainability and decision-making

Companies are not exclusively making decisions about sustainability, but global, national and individual actors also play essential roles in sustainability transitions (Avelino & Wittmayer, 2016). However, as this thesis focuses on SIA on an organizational level, individual and political decision-making are not within the scope of this study. To make sustainable actions, organizations need to make decisions aligned with their sustainability vision and targets. Therefore, to ensure that companies are genuinely aiming for sustainable development, sustainability needs to be integrated into their decision-making processes (Waas et al., 2014). This study is interested in implementing sustainability into decision-making, designing an SIA tool for the case company and selecting relevant indicators, which is why this chapter delves into decision-making and sustainability.

Waas et al. (2014) state that sustainable development should be viewed as a decision-making strategy to operationalize sustainability beyond the concept. Within the context of sustainability, Khalili (2011: 23) defines strategy as:

> "The process of positioning the sustainability concepts within business goals and objectives; developing guidelines that can delineate how specific tools, techniques and business models can identify environmental sustainability-related issues, and instituting mechanisms to gather data and formulate economically and socially acceptable solutions."

Merriam-Webster Online Dictionary (n.d. b) defines decision as 'a determination arrived at after consideration'. Although organizational decision-making seems to follow logic, strategies and indicators, the actual process is less clear-cut and affected by various other factors, such as 'ideology, values, norms, interests, power relationships and institutional context' (Waas et al., 2014: 5514). These influencing factors become even more complicated when it comes to sustainability since sustainability is a value-based matter and wicked problem (Brønn & Brønn, 2018). Hence, the causes and effects are often not obvious (Waas et al., 2014).

One way of describing decision-making is the process of matching one's subjective considerations and scientific understanding with the anticipated effects of various choices and activities (Waas et al., 2014). Sustainability assessments can guide decision-making in the direction of sustainability (Pope, Bond, Hugé & Morrison-Saunders, 2017). While sustainability assessments are not the sole factor impacting decision-making within organizations, they can still be valuable. Sustainability assessment can be adapted to diverse settings and used to interpret sustainability, structure information, and influence decision-making (Waas et al., 2014). According to Waas et al. (2014: 5515), sustainability assessment aids decision-making as it addresses the following identified issues:

> "Interpretation (sustainability should be interpreted considering its organizing principles, applied in a given socio-environmental context); information-structuring (the inherent multi-dimensional complexity of sustainability should be structured into operational information units (for example indicators) and properly communicated in order to feed the decision-making process); influence (sustainability information should exert a real influence on decision-making and on the actual implementation of sustainable development)."

Sustainability assessments advance knowledge on sustainability and its meaning in varying contexts. Additionally, they evaluate the sustainability impact of specific activities and actions (often pre-emptively), resulting in an influence on decision-making and the advancement of sustainability goals (Waas et al., 2014). Various use cases for sustainability assessments range from projects to programs depending on how they are framed and defined

(Pope et al., 2017). Having a question that the assessment should answer can guide the assessment process towards decision-making, such as 'does this proposal make a positive contribution to sustainability?' (Pope et al., 2017: 212). However, since sustainability can be interpreted in varying manners, 'a risk of terminological misuse' also exists (Hugé et al., 2013: 188). Subsequently, the conclusions of the sustainability assessments must align with the primary sustainability discourse in the given context in order for them to affect decision-making (Hugé et al., 2013).

Waas et al. (2014) describe different roles that sustainability assessments and sustainability indicators play within a sustainable development decision-making strategy. First, by conducting sustainability assessments, decision-makers can make informed decisions based on insights and accessible data at the time. Assessments offer a straightforward method to organize multifaceted and intricate information in a structured manner. They also advance sustainability knowledge and are thus, a learning experience for participating stakeholders and decision-makers by expanding their understanding and sustainability viewpoints. Assessments can highlight gaps within existing knowledge and the need for further learning and measurements. During and following sustainability assessments, the discussions amongst decision-makers and stakeholders can spark new insights and possibilities that generate opportunities. Moreover, sustainability assessments are a means for sustainability operationalization as well as stakeholder engagement and activation. Sustainability assessment results can be used to communicate the progress of activities to the broader society and enhance accountability (Waas et al., 2014).

By producing sustainability indicators, the conversation can move from ambiguous notions to clear concepts. This is essential to putting sustainability into practice (Waas et al., 2014). Sustainability indicators can impact decision-making even by merely shedding light on sustainability issues (Dahl, 2012), and they should be continuously reviewed and developed (Waas et al., 2014). Sustainability indicators should be created by utilizing both expert knowledge and stakeholder participation. Indicators designed by experts are primarily quantitative and rigorous measurements in nature, while stakeholder-driven sustainability indicators have a qualitative emphasis. By involving relevant stakeholders in creating the sustainability indicators, the impact on decision-making can be increased. Thus, the two methodologies complement one another, and a consolidation of both approaches is advised. Consolidation ensures that various knowledge and strengths are taken into account (Waas et

al., 2014). Furthermore, by continuously updating and applying sustainability indicators, decision-makers can see the progress of the measured activities (Dahl, 2012).

Waas et al. (2014) suggest that sustainability indicators should not be deemed solely by their accuracy to measure sustainability, but they should be examined by the actual effect they have on decision-making. The authors continue to explain how the focus has been historically more on ensuring and reviewing the indicators' accuracy and less on the application and operationalization (Waas et al., 2014). Given the complex nature of sustainability measurement, the indicators need to be simplified for non-experts to use them. The balancing act between simplification and accuracy is a challenge that needs to be acknowledged, and the uncertainty accompanying it, understood (Waas et al., 2014). Indicators and assessments alone are not enough for large-scale change, but they need to be followed by other measures (Dahl, 2012). To shift sustainability from being a concept that guides and supports activities to something that produces action requires transforming sustainability into a decision-making strategy. Sustainability assessment and indicators are means to address the challenges of implementing sustainability into decision-making (Waas et al., 2014). Thus, the next section will explore sustainability assessment by presenting a comprehensive introduction and various assessment frameworks.

2.4. Sustainability assessment

Sustainability assessment is a mechanism that guides decision-making to take short-term and long-term steps towards more sustainable societies (Devuyst et al., 2001; OECD, 2010). Verheem (2002) further describes it as a means of organizing decision-making to ensure a sustainability viewpoint in planning and executing. By doing so, projects and actions advancing sustainable development are taken (Verheem, 2002). Sustainability assessments can be ex post and ex ante evaluations (Pope et al., 2017). According to Sala, Ciuffo and Nijkamp (2015: 314), sustainability assessment as an evaluation methodology is multifaceted and complicated because it includes social, environmental and economic aspects, as well as 'cultural and value-based elements'. Moreover, it requires understanding and realizing the uncertainties involved, being transparent with the process and engaging with main stakeholders (OECD, 2010; NRC, 2011). Sustainability assessments aim to optimize a decision's societal, environmental and economic gains and mitigate the contradictions between the three sustainability dimensions (NRC, 2011). Sustainability has

long had an ethical sense of fairness for all the creatures on Earth, inhabiting it now and in the future. However, this has not been refined nor made visible in sustainability metrics (Dahl, 2012). Therefore, sustainability values, thresholds and goals, as well as multi- and trans-disciplinary approaches, should be incorporated when carrying out sustainability assessments (Sala et al., 2015).

Conducting sustainability assessments vigorously and suitably is difficult in part due to the innate ambiguity of sustainability as a concept, which was discussed prior (Sala et al., 2015). Sustainability assessment can also be interpreted in various manners as a common terminology and process are lacking (Sala et al., 2015; Pope et al., 2017). Some synonyms for sustainability assessment, according to Sala et al. (2015: 314), are '"Triple Bottom Line Assessment", "3E Impact Assessment [Environmental, Economic, Equity]", "Extended Impact Assessment", and "Sustainability Appraisal"'. SIA is a type of sustainability assessment within impact assessment practice (Pope et al., 2017). Impact assessment examines the potential outcomes of actions taken now or planned (IAIA, n.d.). Pope et al. (2017: 206) further note that the assessments usually focus on 'a proposed new policy, plan or project'. Given that this thesis is also concerned with assessing the sustainability impact of planned innovation projects, this study commonly uses the term sustainability impact assessment and aims to create an SIA tool.

Governmental entities, researchers and companies have created sustainability assessment tools and frameworks for varying external and internal purposes. This chapter will further introduce and examine four different sustainability assessment approaches and frameworks: Environmental Protection Agency's sustainability framework, Sustainability measurement system and reference model, Balanced scorecard and TCOS framework. These were chosen to include a wide range of assessment perspectives representing governmental, research, innovation, and management frameworks. As sustainability assessment requires an interdisciplinary and transdisciplinary approach (Sala et al., 2015), it is relevant to go beyond a company context and explore different types of sustainability assessment frameworks. Exploring these approaches helps answer the research questions by covering different viewpoints while limiting the number of assessment frameworks to stay within a master's thesis scope. The four sustainability assessment approaches and frameworks will be presented, and their relevance to this study discussed in the following sections.

2.4.1. **EPA's sustainability framework**

The United States Environmental Protection Agency (EPA) has a sustainability assessment and management framework which contains steps to influence decision-making and evaluate results. The National Research Council (NRC) designed an operational framework and methodology for the EPA to support decision-making and the inclusion of sustainability into operational activities. The process outlined in the framework is designed to be appropriate for any issue, ranging from human health to environmental hazards (NRC, 2011). The NRC (2011: 5) describes the goal as 'to maximize social, environmental, and economic benefits of a decision and to minimize the adverse effects of conflicts among the three pillars'.

The EPA's approach is presented in this study since it represents a governmental perspective and can offer insights to be taken into account when designing the SIA tool and process for the case company. Although the EPA framework is designed for a governmental body, the guidelines apply to the collective actions necessary to address the challenges of reaching sustainability goals across national entities and industries (NRC, 2011). Thus, the framework represents an overarching sustainability management framework (NRC, 2011). Sustainability targets and principles guide its approach, and it includes steps from selecting 'measurable performance objectives' to reporting about them (NRC, 2011: 36). Moreover, the "Sustainability Management and Assessment" step in the full process focuses specifically on integrating sustainability into decision-making (NRC, 2011). The process is shown in Figure 4 below.

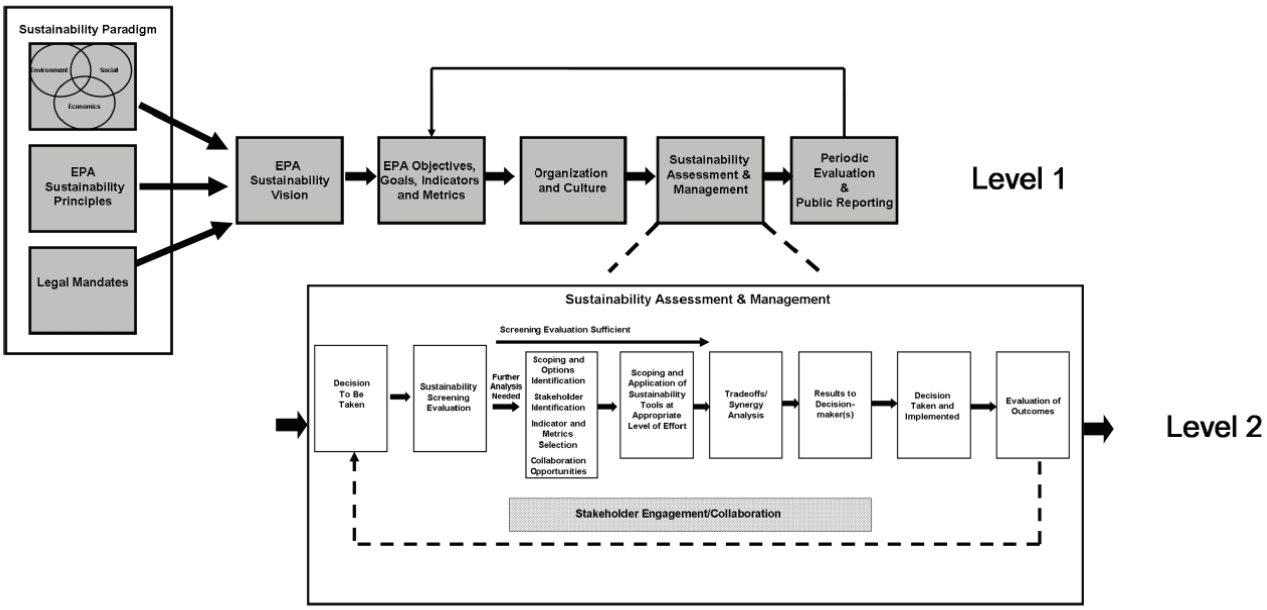

Figure 4: A framework for EPA sustainability decisions (NRC, 2011)

As shown in the figure, the sustainability framework has two levels. The first level showcases the importance of incorporating sustainability assessment and management into the EPA's overall sustainability strategy and goals. The second level is a means of operationalizing sustainability (NRC, 2011). However, before operationalization, a clear understanding of sustainability and its definition are needed (NRC, 2011). In this case, the NRC advises the EPA to undertake the three pillars of sustainability (environmental, social and economic dimensions) as its formal sustainability approach and use the pillars to guide decision-making. Although there are other valid sustainability concepts and models to choose from, the NRC (2011) sees that the three pillars of sustainability are a standard form of understanding sustainability and integrating the core aspects of sustainable development into organizations. Moreover, clear targets, assessed on a short- and long-term basis and consistent with the organization's sustainability vision, promote sustainability operationalization and signal commitment (NRC, 2011). Building upon this, the organizational culture can be shaped to be sustainability-oriented, where employee empowerment plays a large part. To succeed, the organization needs to educate employees on sustainability and ways they can be drivers of change in their work (NRC, 2011).

This thesis is concerned with understanding how to assess sustainability impact and incorporate sustainability in decision-making. The first level of the EPA's framework illustrates how sustainability assessment cannot be separate from the organizational process of integrating sustainability into the strategy, culture and vision (NRC, 2011). Instead, to implement an assessment tool into decision-making, it needs to be communicated, viewed, and accepted as a means of operationalizing the company's sustainability vision and goals. The case company has a formal sustainability definition, vision and targets, as well as an annual sustainability report that details progress on a company-wide level. Thus, going deeper and assessing the sustainability impacts of company activities, such as innovation projects, would be a logical and necessary next step in achieving determined sustainability goals and ensuring alignment with strategy.

Sustainability assessment and management process

The second level of the EPA's sustainability framework, "Sustainability Assessment and Management", provides a decision-making approach for incorporating sustainability into the

agency's daily work. It deals with the practicalities of implementation (NRC, 2011). The figure below shows the process and its different steps.

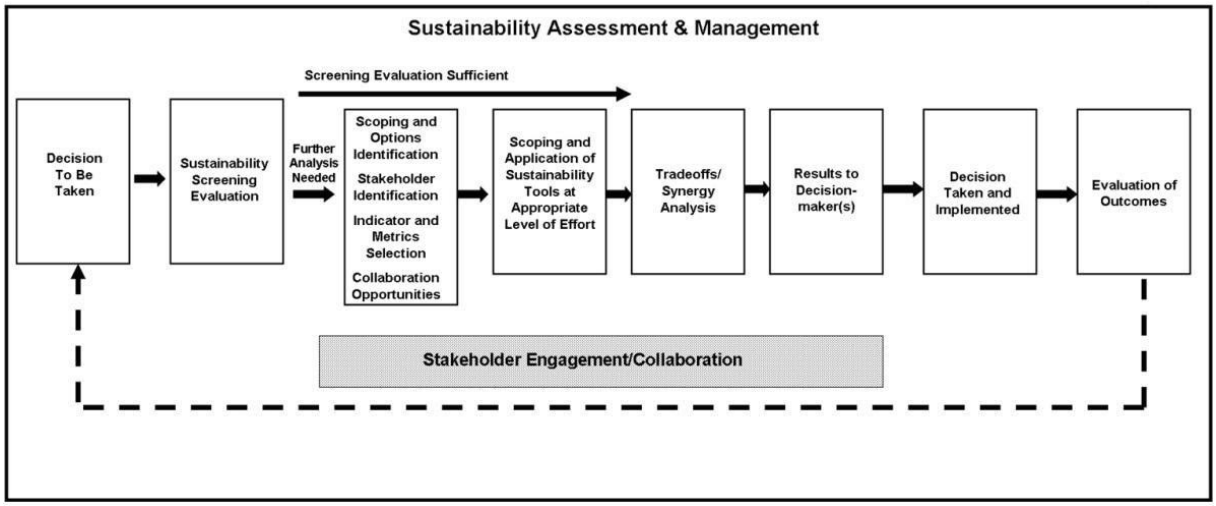

Figure 5: Decision-making approach for sustainability integration (NRC, 2011)

As presented in Figure 5, the process is iterative, for sustainability should be assessed and managed continuously. In the EPA's process, the initial screening is crucial. The first step determines whether undergoing the process is appropriate for the project, program or policy at hand. If routine procedures are in place for certain types of projects or programs, following the entire sustainability assessment and management process may be both time-consuming and unnecessary (NRC, 2011). Guidelines on the recommended depth of the analysis can be offered based on existing examples. For instance, in cases where the project is unique and will have potentially far-reaching effects on the different sustainability dimensions, undertaking the analysis and process may be helpful. On the other hand, conducting a sustainability assessment process with high-stakes cases may be challenging since they typically have various stakeholders involved, requiring higher levels of stakeholder management and collaboration. Also, the impacts of the projects on different stakeholder groups may be divergent, causing positive impacts for some while negative impacts for others (NRC, 2011).

The initial assessment to evaluate the needed sustainability evaluation level can be quickly conducted using a check-list approach or impact matrix and comparing the project proposal against various social, environmental and economic sustainability criteria (NRC, 2011). For this study's case company, a similar type of initial assessment could be useful as some innovation projects may have far-reaching and long-term sustainability impacts, while others

might not. Hence, if a project is expected to have widespread consequences in one or more sustainability dimensions, it should be further evaluated and monitored.

Subsequently, the NRC (2011) recommends having a "sustainability toolbox", from which the organization can employ suitable analytical and impact assessment tools. For the content of the toolbox, various possibilities are mentioned, such as risk assessment, life-cycle analysis, cost-benefit analysis and integrated assessment tools that can be used depending on the issue. The tools should be used to evaluate impacts on key environmental, economic and social indicators in addition to the impacts of identified alternative options. During this phase, conducting quantitative, qualitative and transparent assessments as well as uncertainty and sensitivity analyses are recommended (NRC, 2011). Potential action steps can be evaluated by deliberating whether they will improve or diminish human and environmental well-being in the present and future and to what scale. Even though the impacts cannot be necessarily measured or fully predicted due to the multifaceted nature of sustainability issues, qualitative depictions with a systems thinking approach can be beneficial for decision-making (NRC, 2011).

A version of the sustainability toolbox could be useful also in this study's case company to assess the sustainability impact of potential innovation projects. As the innovation projects are not limited to specific business units in the company, they may vastly vary in industry and sustainability impact. Thus, various sustainability evaluation tools and methods should be available since there is no one-size-fits-all. Subsequently, since the focus is on potential innovation projects, quantitative measures may not be possible in the initial phases, so having a structured approach to qualitatively describe potential risks and impacts is relevant for the study. Grasping the magnitude of the sustainability impact and considering whether the project worsens or improves relevant sustainability elements ensures alignment with overall sustainability strategies and vision (NRC, 2011).

Another step in the EPA sustainability assessment model is analyzing the trade-offs and synergies. The model emphasizes identifying win-win situations with the most considerable synergies and most minor conflicts amongst the three sustainability dimensions. Trade-offs should also be explicitly understood and considered with the larger goal of achieving 'net sustainability impact' (NRC, 2011: 66). The aim of this study is not to drive projects towards achieving win-win situations in terms of sustainability. However, understanding trade-offs

and alternative solutions can be helpful, especially when the sustainability impacts are far-reaching. This also increases transparency and supports decision-makers as they have options to consider, which is the next step in the process (NRC, 2011).

The analyses, trade-offs and alternative options are presented to decision-makers to make informed decisions and consider the results. After the decisions are implemented, the outcomes are re-evaluated regarding the relevant sustainability elements (NRC, 2011). Evaluation requires clear sustainability indicators, relevant data and validity of taken actions to adjust goals and future actions accordingly. Feedback loops are needed to see what works, what was perhaps missed and how to minimize uncertainties going forward (NRC, 2011). The NRC (2011) emphasizes that the sustainability assessment and management process should be extensive and use a systemic approach. Thus, current solutions and alternatives should also be assessed based on their sustainability impacts as well as the magnitude, longitude and present and future repercussions. Finally, the process should contain stakeholder involvement and collaboration, as shown in the framework. Utilizing metrics that deliver precise, detailed and trustworthy data allows the EPA to perform sustainability assessments for 'major decisions, projects, activities, and programs' and publish the results (NRC, 2011: 7).

In the SIA of potential innovation projects within the case company, transparency and stakeholder engagement are also integral elements. The company produces public, annual sustainability reports. However, taking the next step and administering extensive sustainability assessments and producing reports on projects that have either expected or proven far-reaching sustainability impacts would increase transparency. Furthermore, stakeholders should be actively engaged, as stakeholder involvement is a critical component of sustainability strategies (NRC, 2011).

2.4.2. **Sustainability measurement system and reference model**

Moving from the EPA's sustainability framework to another model of sustainability assessment, Delai and Takahashi (2011) present a comprehensive analysis on eight notable sustainability measurement initiatives: *The Indicators of Sustainable Development of the Commission on Sustainable Development, The Dashboard of Sustainability, The Barometer of Sustainability, The Global Reporting Initiative, The Sustainability Metrics of the*

Institution of Chemical Engineers, The Dow Jones Sustainability Index, The Triple Bottom Line Index and *The ETHOS Corporate Social Responsibility Indicators*.

Delai and Takahashi's (2011) analysis and reference model are of interest to this study. The study represents a research perspective and shares the objective of supporting corporations operationalize sustainability and embed it into daily activities. The authors evaluate the similarities, differences and shortcomings of the initiatives based on economic, social and environmental dimensions while benchmarking sustainability literature. As established, the outcome of this study is an SIA tool and criteria including the three dimensions of sustainability, and thus, Delai and Takahashi's (2011) reference model proposal is relevant. Furthermore, Delai and Takahashi (2011) outline a process for creating sustainability measurement systems. The steps in the process can also be practical when designing the SIA tool for the case company. The complete process with detailed explanations can be found in Appendix 1 of this thesis. A shortened version is shown below.

Table 2: Creating a sustainability measurement system (Delai & Takahashi, 2011)

Step	Category	Objective
1. Starting point	Sustainability vision and concept	Define sustainability vision and concept. Define sustainability goals.
2. Content	Structure	Establish system abstraction levels.
3. Process	Content of each level	Define content of each system level.
	Scope	Define measurement time horizon and scope.
	Data	Define data to be collected – type and aggregation level.
	Interface	Define how data will be displayed considering: complexity, openness, type of interface and learning potential.
	Broad participation	Validate data and interface with decision-makers. Define targets with decision-makers. Establish action plans with decision-makers to achieve targets.
4. Capacity for continuous assessment	Capacity for assessment	Assign responsibility of routines to collect, collate, calculate, share and support the assessment process. Define corrective actions in case of target's non-achievement. Review indicators, policies, targets and actions.

The first step is defining sustainability and its targets. Although the definitions differ in the comparative analysis executed by Delai and Takahashi (2011), they mostly adhere to the Brundtland definition of sustainable development or the triple bottom line concept. As mentioned previously, the triple bottom line has also been established as the case company's sustainability approach and definition. The sustainability concept and vision set the

foundation and direction for the sustainability targets. Thus, they vary across organizations. Delai and Takahashi (2011) propose that sustainability targets are integrated into compensation schemes of organizations. Tying sustainability performance to compensation is a rising discourse amongst businesses, and although general support for it exists, the contributions to sustainable development are still inconclusive (Emerton & Jones, 2019).

The second step in the process, "Content", delves deeper into the dimensions and indicators. The proposed dimensions are environmental, social and economic sustainability (Delai & Takahashi, 2011). These will be used in the SIA tool for the case company as well since they are the formally adopted sustainability dimensions within the company. As for the reference model designed by Delai and Takahashi (2011: 444), the dimensions include four levels: 'dimensions (basic dimensions of sustainability), themes (major issues of each dimension), sub-themes (important topics of each theme) and indicators (measures of each sub-theme)'. The structure integrates identified best practices from the examined initiatives and includes known sustainability issues within each dimension. Figures 6–8 show the dimensions, themes and sub-themes to be assessed and measured. The environmental dimension approaches environmental sustainability through ecosystem well-being and covers themes that are generally deemed essential for sustainability. The social dimension assesses the company in question and how it relates to and treats its stakeholders. Finally, the economic dimension examines how the company relates to and creates value for its shareholders (Delai & Takahashi, 2011).

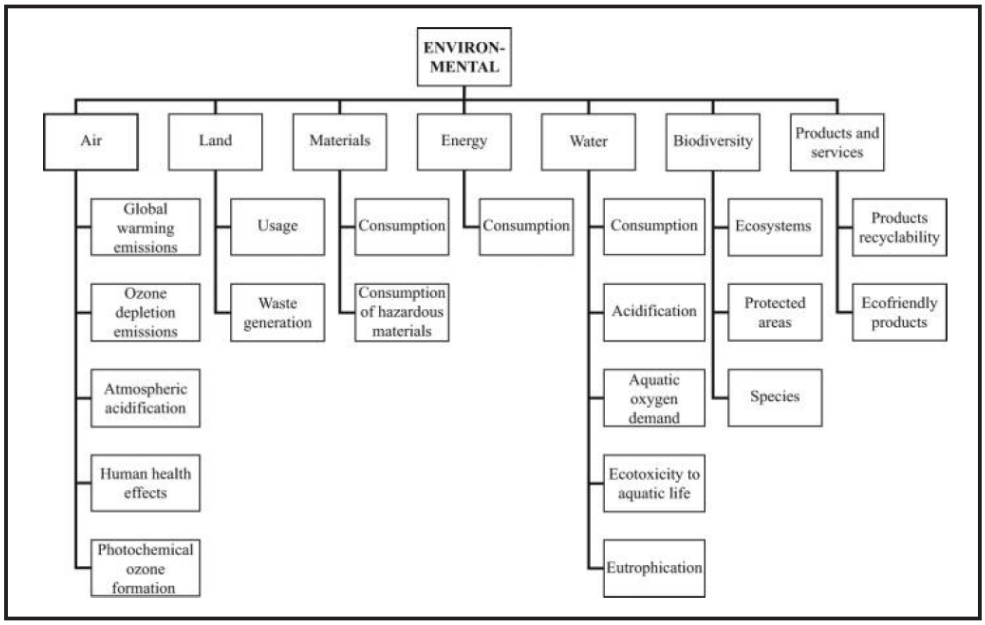

Figure 6: Environmental Dimension (Delai & Takahashi, 2011)

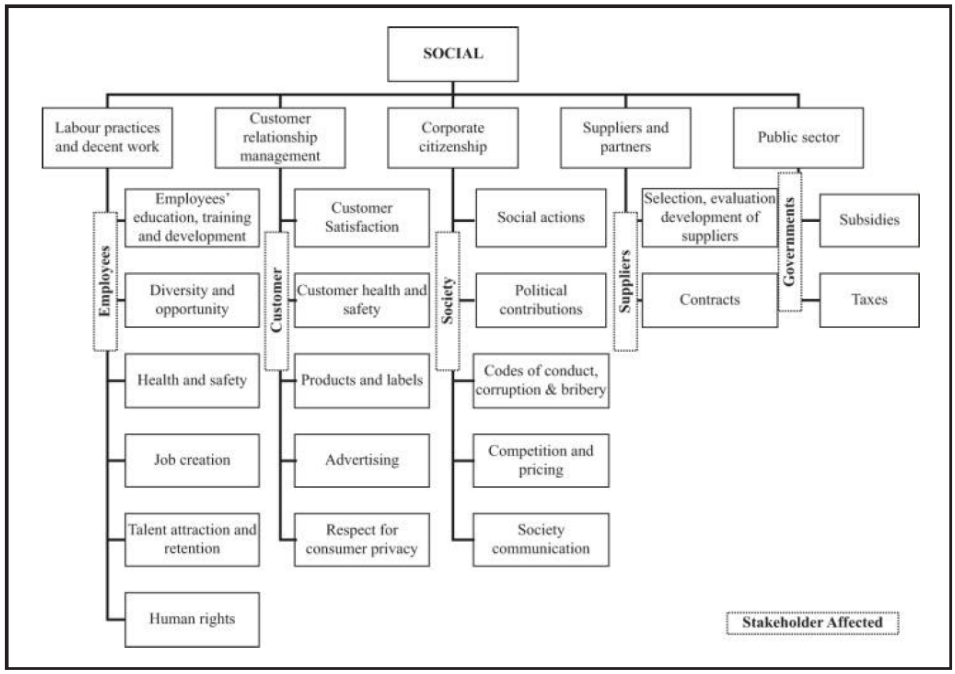

Figure 7: Social Dimension (Delai & Takahashi, 2011)

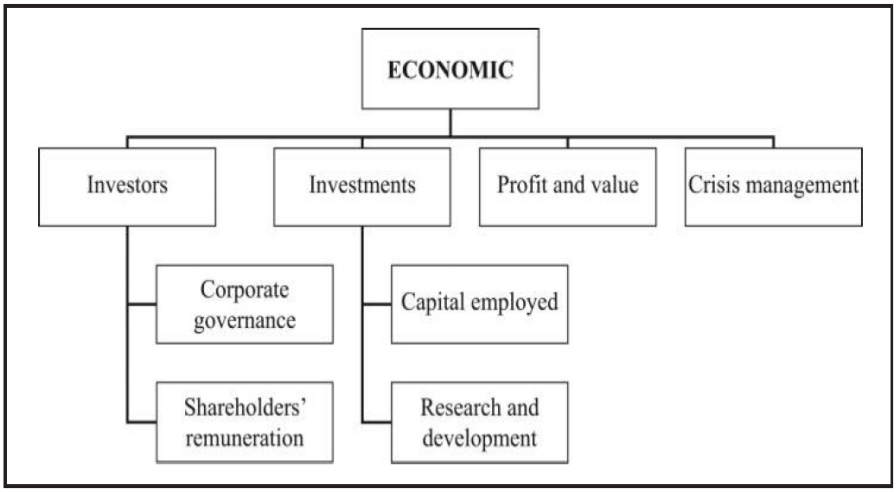

Figure 8: Economic Dimension (Delai & Takahashi, 2011)

The entirety of the themes represented in the reference model may not be relevant for each organization as such, which is why they are not covered more in-depth in this thesis. Existing literature on the matter concludes that sustainability measurement initiatives should center around a narrow set of sustainability elements. A simpler model reduces complexity for managers and supports decision-making (Delai & Takahashi, 2011). For this thesis, many of the identified sub-themes and indicators are not relevant. The proposed model covers an organization's entire sustainability performance, while this thesis focuses on innovation

projects. However, parts of it, such as the process and themes, are of interest, as they also represent what is generally accepted and seen as fundamental to measure sustainability.

In addition to deciding what sustainability elements are measured and how, the chosen perspective, scope, data collection and analysis methods should be agreed upon (Delai & Takahashi, 2011). Subsequently, the third stage focuses on the interface and inclusion of decision-makers to ensure alignment, clear responsibilities and management of the process (Delai & Takahashi, 2011). Finally, the process should include continuous reiteration measures and feedback loops (Delai & Takahashi, 2011). In the context of this case study, the aforementioned points are good to keep in mind. An SIA tool's simplicity is critical in integrating the tool into the decision-making process and being adopted by employees. Involving decision-makers and relevant stakeholders to create the tool is integral to establishing the appropriate targets and measured elements. Reiteration and refinement of the tool and process should also be considered.

Delai and Takahashi (2011) note that many sustainability measurement initiatives mainly focus on the environmental dimension and lack clarity and agreement on what elements to measure and how. Furthermore, companies' sustainability activities and procedures are still primarily created for sustainability reports and are independent of other key performance indicators. Consequently, sustainability performance and measurements are often not present in everyday operational work or decision-making procedures (Delai & Takahashi, 2011). While establishing and integrating a sustainability assessment framework within organizations is difficult, it aids in claiming the benefits and mitigating the risks of sustainability (Delai & Takahashi, 2011). Operationalizing sustainability and tying it to decision-making are focal points of this thesis, which is why creating an SIA tool is further justified as a means to do so.

2.4.3. **Balanced scorecard approach**

The balanced scorecard (BSC) is one of the most popular management tools used by organizations (Rigby & Bilodeau, 2018). Kaplan and Norton (1992: 71) designed it as a 'set of measures that gives top managers a fast but comprehensive view of the business. The balanced scorecard includes financial measures that tell the results of actions already taken'. A BSC describes the company's success and examines if management produces optimal

outcomes. It converts purpose and vision declarations into a collection of quantifiable and assessable goals and success metrics (Rigby, 2017). The approach also allows for integrating sustainability measurement into strategic planning, activities and profitability, and understanding the relationships amongst the three (Butler et al., 2011). The balanced scorecard approach to sustainability assessment is included in the thesis, as it represents a widely known management tool for organizations. Measuring sustainability by using standard methods and tools may increase the adoption of SIA and reduce complexity.

Butler et al. (2011) acknowledge that sustainability is not always a win-win situation for companies and involves trade-offs, namely between environmental and economic performance. Furthermore, sustainability assessment often involves measuring quantitative outputs, such as water consumption, instead of monetary measures. This, in itself, separates sustainability analyses from financial analyses, which makes sustainability integration more challenging. To assess the company's sustainability impact and include nonfinancial sustainability metrics, the specific sustainability activities included in the assessment should be decided (Butler et al., 2011).

The traditional BSC is a performance assessment framework that looks at four company perspectives: financial, customer, internal business processes, and innovation and learning (Kaplan & Norton, 1992; Butler et al., 2011; Singh, Olugu, Musa & Mahat, 2018). The perspectives contain performance measures and objectives aligned with corporate strategies. The financial perspective focuses on maximizing shareholder value and uses routinely relevant financial measures, such as 'operating cash flows, return on investment (ROI), and changes in operating income over time' (Butler et al., 2011: 4). The customer perspective approaches the company from the customer point of view and looks at the value proposition. Measures used for this perspective aim attention towards the company's financial success in the long-run and consist of 'market share, consumer satisfaction trends, and product or service delivery time' (Butler et al., 2011: 4). Subsequently, the internal business processes perspective gauges operational 'efficiency and effectiveness', while learning and growth concentrate on value creation through indicators, such as innovation development, employee retention and upskilling (Butler et al., 2011: 4). The basic notion is that if the latter three perspectives are taken into account and appropriately managed, they ultimately contribute to the company's financial success (Butler et al., 2011). There are various approaches to utilizing the BSC and including sustainability. An additional sustainability perspective can

be introduced to the BSC, or a separate sustainability balanced scorecard (SBSC) can be created. Conversely, sustainability elements can be incorporated into the existing four perspectives (Butler et al., 2011).

By including an additional sustainability perspective to the existing four perspectives, companies can convey the integrality of sustainability to their core strategy. Companies can thus evaluate their economic, social and environmental performance through sustainability indicators (Butler et al., 2011). However, having an additional sustainability perspective may arguably have adverse effects and isolate sustainability from other key performance indicators and perspectives, thus diminishing its operationalization (Butler et al., 2011). The consequences are comparable to large companies creating sustainability reports highlighting their commitment to sustainability yet not integrating it into their daily operations (Butler et al., 2011).

The second option of developing a distinct SBSC is suitable and beneficial for companies wanting to emphasize sustainability impact measurement but not implement the original and comprehensive BSC. It is also appropriate for companies already using the BSC and share the same motivation of highlighting sustainability but are not interested in reorganizing and modifying their current BSC (Butler et al., 2011). Dias-Sardinha, Reijnders and Antunes (2002) propose four perspectives for a cascading SBSC building upon the triple bottom line: sustainability, stakeholders, processes and learning. The three levels of the model, corporate, business and department, ensure that the measures and goals are trickled down, visible on the different levels and translated into action. Strategies should ripple downstream to business functions (Dias-Sardinha et al., 2002). This second approach supports operationalization and narrows the implementation gap between sustainability reports and sustainability actions (Dias-Sardinha et al., 2002).

In the SBSC, the first perspective, sustainability, is interested in understanding ‘what are the environmental, social, and related economic aspects from/for sustainability that the company focuses on and that are subject to measurement’ (Dias-Sardinha et al., 2002: 61). For example, suggestions in this category include getting pledges on issues within the three sustainability dimensions on a corporate level and appointing someone responsible for sustainability on a business level. Furthermore, the company can take action and track how a life-cycle approach is taken (or not taken) in its activities on a departmental level (Dias-

Sardinha et al., 2002). The stakeholder perspective looks at regarding and acceptably measuring eco-efficiency for stakeholders. Moreover, the processes perspective considers how to reach eco-efficiency within relevant processes (Dias-Sardinha et al., 2002). The last perspective, learning, focuses on pinpointing the innovation upskilling and learning needs regarding sustainability know-how (Dias-Sardinha et al., 2002). The authors note that the final format of the SBSC should be modified to suit the organization's sustainability considerations, type of business, strategies, and other factors (Dias-Sardinha et al., 2002). Within this second approach of designing a separate SBSC lies the same threat as in the prior alternative: sustainability is again disconnected from the company's core business (Butler et al., 2011). Appendix 2 shows a table with the SBSC perspectives, objectives and assessments, providing more examples of actions to take within the cascading levels.

As the last option, Butler et al. (2011) propose that companies integrate a sustainability perspective into the original perspectives. This approach may require less effort for companies that already use the BSC as such. By adopting this approach, companies acknowledge that sustainability must be incorporated into strategies and day-to-day business and is relevant to organizational performance. The link between sustainability performance and organizational performance must be explicitly defined and strengthened by selecting relevant metrics. Thus, additional metrics assessing sustainability can be added to the perspectives or replace current metrics. The integration level and amount of sustainability metrics affect how thoroughly sustainability is fused to the company strategies and daily operations (Butler et al., 2011).

For all three approaches, sustainability targets and processes must be 'controllable by the firm's employees, quantifiable and include all component elements when a multidimensional measure is used' (Butler et al., 2011: 6). For example, the reduction of greenhouse gases by a certain percentage would qualify as a multidimensional measure. In this case, all types of greenhouse gases contributing to global warming should be included in the measurements, not merely a selected few. Additionally, Butler et al. (2011) provide a set of points to guide decision-makers choose appropriate sustainability metrics. These considerations are presented in the figure below.

In selecting measurements for the balanced scorecard, make certain that:

1. There is an underlying objective for the measurement.
2. Measurement terminology is defined and used consistently throughout the organization.
3. Information needed for the measurements is obtainable.
4. The measurement will create behavior that is in concert with organizational goals and objectives.
5. While there will likely be a combination of lagging and leading indicators, leading indicators are more appropriate to help predict how the organization will perform in the future.
6. The measurements should be used to track performance trends.
7. Apppropriate benchmarks and targets are identified.

Figure 9: BSC Measurement Selection Considerations (Butler et al., 2011)

Like Dias-Sardinha et al. (2002), Butler et al. (2011) emphasize that the sustainability metrics will differ across companies, as their strategic objectives and businesses vary. Too many indicators may divert attention from the core elements, so the BSC measures need to align with each company's strategies, targets, and activities (Butler et al., 2011).

The BSC measurement selection considerations in Figure 9 and the strategic perspective offered by the SBSC can be utilized when creating the SIA tool for the case company. Given that this study examines how to incorporate sustainability within decision-making, aligning and understanding the links between strategic objectives and sustainability performance are integral to increasing sustainable activities and projects. Initially, the objective is to create a separate tool evaluating the sustainability impact of innovation projects. However, in the future, the sustainability criteria could be integrated into the case company's regular performance evaluation framework, as presented as an option with the BSC.

2.4.4. **TCOS framework**

The fourth presented framework, TCOS (technological, commercial, organizational and social) framework, is specifically designed to determine the main opportunities, threats, and possible unplanned externalities in the initial phases of developing a new technology or innovation (Hall, Matos & Bachor, 2019). According to Hall, Bachor and Matos (2014), overcoming uncertainties has been widely discussed in innovation research and seen as vital to technology diffusion and strategies. Thus, for any new technology to be successfully diffused in the market, it must address and surmount TCOS uncertainties. Importantly, stakeholder feedback should be collected in the beginning phases of the development

because it is easier to make changes early on, and it supports the technology's acceptance later on (Hall et al., 2014). Since this study pertains to assessing the sustainability impact of innovation projects within a case company, the TCOS framework is relevant and offers a needed perspective to sustainability assessment. The framework is suitable for this study as the case company's accelerator specializes in early-stage technology development, intrapreneurship and innovation.

The objective of the TCOS framework is furthering the adoption of innovations by ensuring the TCOS perspectives are considered (Hall et al., 2014). Hall et al. (2019) argue that new technology is seen as a panacea for sustainability issues, creating pressure for green innovation and its diffusion. Nevertheless, research and general knowledge on the development and diffusion of innovations advancing sustainability through green technology projects appear minimal (Hall et al., 2019). In addition to the primary need for the technology to be feasible, gaining legitimacy through communication, stakeholder management, and institutional acceptance of regulators are integral (Hall et al., 2019). Thus, the TCOS framework can be utilized in sustainable innovation and technology development as a guide throughout the development process (Hall et al., 2019).

The first perspective, technological uncertainty, centers around science and engineering obstacles and the feasibility of the innovation's technology. Subsequently, commercial uncertainty observes innovations from a business perspective and its competitive advantage. This perspective relates to market feasibility and whether the innovation can be deployed in the intended market. Key user feedback needs to be gathered as it is seen as valuable input for designing the technology in the early phases. The third perspective, organizational uncertainty, explores ways the latest technology can be profitable for the organization. This perspective includes securing and protecting intellectual property and ensuring that necessary complementary assets are available for the organization. Example implications may include discussions on whether the technology should be sold off if complementary assets are not readily available either in-house or from a partner (Hall et al., 2019). Lastly, societal uncertainty is concerned with the new technology's social effects and how the technology development impacts or is impacted by various stakeholders and groups (Hall et al., 2014). The first three uncertainties (technological, commercial and organizational) relate to 'establishing cognitive legitimacy', while the last uncertainty (social) is concerned with gaining 'socio-political legitimacy' (Hall et al., 2019: 881). In this study's case company,

the first three uncertainties are covered in the accelerator's existing decision-making process as part of evaluating whether the innovation project can move to the next phase. Thus, the fourth uncertainty, social uncertainty, is most relevant to this thesis because sustainability concerns and externalities are considered within the perspective.

Figure 10 shows how the TCOS framework can support an innovation project, its development and diffusion of new technology. The model is a modified version of Clark and Wheelwright's contemporary funnel development (1993).

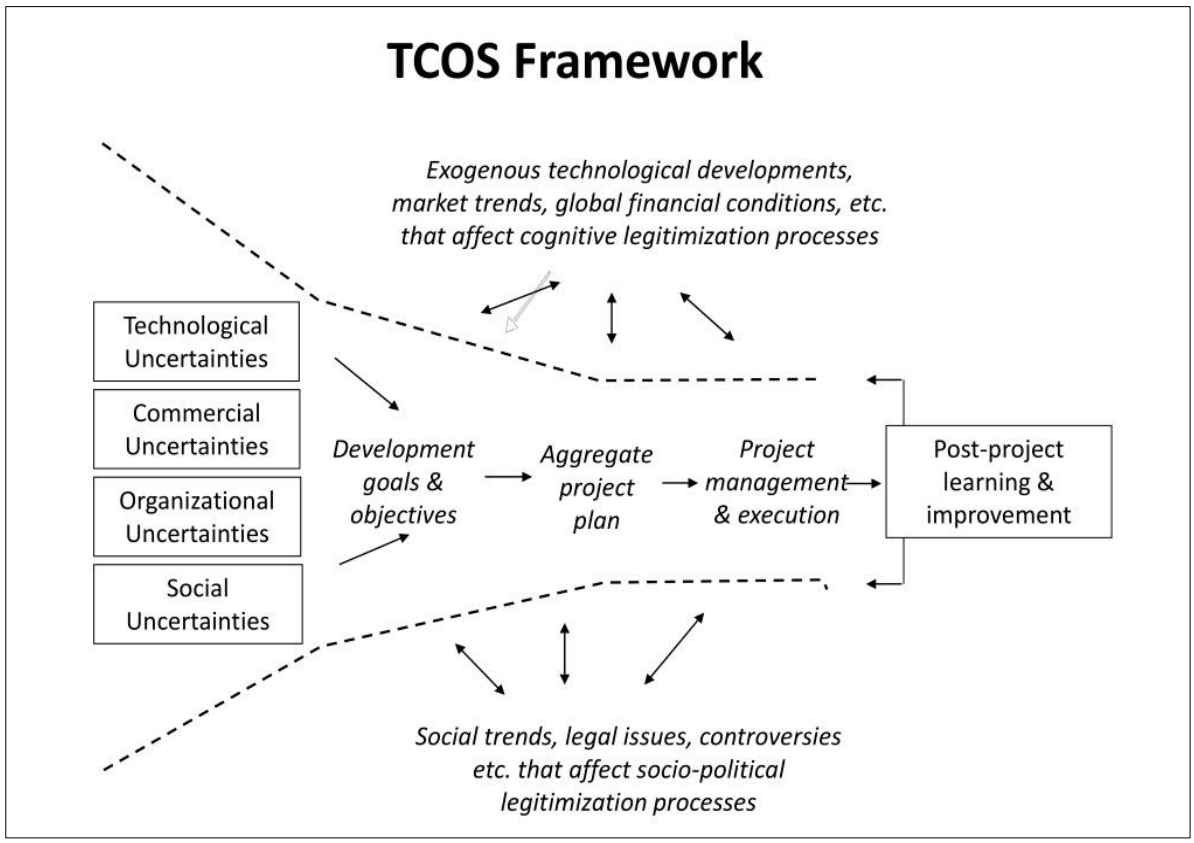

Figure 10: TCOS Framework (Hall & Linton, 2012).

Considering and examining the four perspectives ensures that the necessary knowledge, legitimacy, feasibility and stakeholder support to thrive are covered. While all aspects are essential for early-stage technology diffusion, Hall et al. (2019: 881) argue, based on existing literature, that 'the core reason for a green-tech venture's existence resides with its socio-political legitimacy'. The framework can be used to assess a green-tech innovation and its diffusibility by analyzing each perspective and walking through the four uncertainties in the early phases of development. The innovation path can then be modified for better acceptability and successful diffusion (Hall et al., 2019).

As this thesis is looking at implementing an SIA tool for innovation projects within the context of digitalization, understanding the TCOS uncertainties is pertinent to gaining legitimacy and moving forward with the projects. The social uncertainties include environmental issues, stakeholder concerns and societal issues, which link to sustainability assessment. Considering Hall et al. (2019) demonstrate that attaining socio-political legitimacy is crucial, the need for evaluating the sustainability impact of innovation projects is further supported.

2.4.5. **Challenges of sustainability assessment**

Based on the assessment frameworks and identified challenges widely discussed in the literature, sustainability involves complex issues, starting from the concept itself (Lankoski, 2016) to assessment measures (Sala et al., 2015). Sala et al. (2015) note that sustainability assessment is a manifold, intricate matter. An assessment should simultaneously understand the relationship and boundary between science and policy and determine whether something advances sustainable development, all while having a transdisciplinary approach. The multifaceted nature of sustainability requires assessment mechanisms to consider environmental, economic and social aspects, values and cultures (Sala et al., 2015) and interrelations amongst the dimensions (Pope et al., 2004).

Although organizations or policy-makers can carry out sustainability assessments, it does not guarantee that the projects, policies or technologies examined are then, in fact, sustainable, which further illustrates the challenge of the matter (Sala et al., 2015). As sustainability can be interpreted in various ways, assessments and solutions can also be influenced by the organizational, political and subjective contexts (Hugé et al., 2013). Organizations adopt various approaches to sustainability assessment and management and lack a shared reference point or framework (Adams & Frost, 2008). Thus, they are somewhat affected by existing procedures (Adams & Frost, 2008).

Pope et al. (2004) and Sala et al. (2015) add that merely adding social, economic and environmental perspectives into an integrated assessment model does not ensure sustainability practices and standards are upheld. Companies face the hurdle of attempting to enhance the three sustainability dimensions' performance simultaneously when

sustainability strategies and everyday business are often not aligned or connected (Epstein, 2008). Assessing the sustainability impacts of the three dimensions and determining interrelations between them typically involves exploring trade-offs (Pope et al., 2004). However, this approach may legitimize economic objectives as sustainable and allow for trade-offs that are less favorable in terms of social and environmental sustainability. Solely focusing on having a net positive impact may still negatively impact one or two sustainability dimensions (Pope et al., 2004).

Moreover, it is challenging to have consistent indicators and criteria that are both cross-cutting and relevant for each organization. Organizations tend to loosely choose indicators from the areas of environmental, social and economic sustainability where information is available (Waas et al., 2014; Sala et al., 2015). This can cause biased results and a failure to determine the links between the different sustainability areas (Sala et al., 2015). Hak, Kovanda and Weinzettel (2012) add that similar to the widespread increase in the adoption of sustainability assessments, the growth of sustainability indicators does not equate to them being accurate or correctly utilized. Thus, Warhurst (2002) calls for collective indicators and measures to support sustainability assessment. However, it is not a straightforward task to create indicators that measure sustainability impact accurately (Dahl, 2012) and are also validated, analyzed and standardized properly (Hak et al., 2012), especially since many of the measured elements vary greatly and are fuzzy by nature (Singh et al., 2018). According to Hak et al. (2012: 47), 'indicators should, yet are not validated based on three criteria: self-validation (done by the developers themselves), scientific validation (independent experts' judgment) and social validation (public participation)'.

Subsequently, even with the proper sustainability assessments and indicators in place, it is challenging to forecast future impact, specifically in terms of environmental, social and economic impact. A complete comprehension of the intricate complexities of adopting policies and processes is often not within our reach (Sala et al., 2015). Sustainability tends to measure elements that are evolving continuously and exponentially (Dahl, 2012). Furthermore, the knowledge surrounding sustainability varies amongst decision-makers (Singh et al., 2018). The values and biases of decision-makers can also affect how the results are taken into account and operationalized (Waas et al., 2014).

2.4.6. **Bellagio Sustainability Assessment and Measurement Principles**

To address the challenges, uncertainties and criticism, this section presents guiding principles that can be followed when creating and executing a sustainability assessment process (Pintér, Hardi, Martinuzzi & Hall, 2012; Sala et al., 2015). In the late 90s, a set of principles known as the Bellagio Principles were designed by an international expert group (Becker, 2004; Pintér et al., 2012). Throughout the years, the Bellagio Principles have been viewed as a foundation for designing and evaluating sustainability assessment frameworks (Becker, 2004; Pintér et al., 2012). Like the initial principles, an assembly of experts created a revised version: Bellagio STAMP (Sustainability Assessment and Measurement Principles) (Pintér et al., 2012). Sala et al. (2015) propose that these sustainability principles should be kept in mind when designing a sustainability assessment process.

The revised version, Bellagio STAMP, has eight principles to guide the sustainability assessment process: guiding vision, essential considerations, adequate scope, framework and indicators, transparency, effective communications, broad participation, and continuity and capacity (Pintér et al., 2012). Table 3 compiles the principles directly from Pintér et al. (2012).

Table 3: Bellagio STAMP (Pintér et al., 2012: 22-24).

Principle 1: Guiding vision	Assessment of progress toward sustainable development will be guided by the goal of delivering well-being within the capacity of the biosphere to sustain it for future generations.
Principle 2: Essential considerations	Assessment of progress toward sustainable development will consider: - the underlying social, economic and environmental system as a whole and the interactions among its components, including issues related to governance; - dynamics and interactions between current trends and drivers of change; - risks, uncertainties, and activities that can have an impact across boundaries; - implications for decision making, including trade-offs and synergies.
Principle 3: Adequate scope	Assessment of progress toward sustainable development will adopt: - an appropriate time horizon to capture both short- and longterm effects of current policy decisions and human activities; - an appropriate geographical scope.
Principle 4: Framework and indicators	Assessment of progress toward sustainable development will be based on: - a conceptual framework that identifies the domains within which core indicators to assess progress are to be identified; - standardized measurement methods wherever possible, in the interest of comparability; - comparison of indicator values with targets, as possible.

Principle 5: Transparency	Assessment of progress toward sustainable development will: - ensure the data, indicators and results of the assessment are accessible to the public; - explain the choices, assumptions and uncertainties determining the results of the assessment; - disclose data sources and methods; - disclose all sources of funding and potential conflicts of interest.
Principle 6: Effective communications	In the interest of effective communication, to attract the broadest possible audience and minimize the risk of misuse, assessment of progress toward sustainable development will: - use clear and plain language; - present information in a fair and objective way that helps to build trust; - use innovative visual tools and graphics to aid interpretation and tell a story; - make data available in as much detail as is reliable and practicable.
Principle 7: Broad participation	To strengthen its legitimacy and relevance, assessment of progress toward sustainable development should: - find appropriate ways to reflect the views of the public, while providing active leadership; - engage early on with users of the assessment so that it best fits their needs.
Principle 8: Continuity and capacity	Assessment of progress toward sustainable development will require: - repeated measurement; - responsiveness to change; - investment to develop and maintain adequate capacity; - continuous learning and improvement.

Pintér et al. (2012) argue that the Bellagio STAMP are highly applicable for assessing projects. When designing an SIA tool for the case company, all eight principles can and should be considered. By building upon the principles, some sustainability assessment challenges can be addressed and mitigated (Sala et al., 2015). The principles highlight a holistic perspective and support sustainability operationalization (Pintér et al., 2012). Having guiding principles when creating the SIA tool and implementing it can increase its adoption and the results' validity. By taking a transparent approach, decision-makers and stakeholders reviewing the process and results can form opinions and make better-informed decisions (Pintér et al., 2012).

2.4.7. **Conclusion: Sustainability Assessment**

The literature review provides a foundation for designing an SIA tool for the case company and integrating sustainability into decision-making. The covered sustainability assessment frameworks and principles are all useful in defining the process and criteria. The EPA's

framework highlights the importance of harmonizing sustainability assessment with the organization's strategy, vision and culture (NRC, 2011). The initial screening model can also be used as an approach for the case company because the intention is to create an SIA tool that allows for the project's sustainability impact to be examined against the defined criteria. Delai and Takahashi's (2011) sustainability measurement system and reference model includes supportive steps for creating a sustainability measurement system. Furthermore, the authors outline relevant themes and indicators that the criteria can be benchmarked against (Delai & Takahashi, 2011). The BSC framework presents variations as to how sustainability can be assessed and integrated with other assessment frameworks, highlighting the value of creating an SIA tool that fits the context and organization (Butler et al., 2011). Finally, Hall et al. (2019) argue the necessity of gaining socio-political legitimacy in new technology diffusion, illustrated in the TCOS framework. As the SIA tool will be used to evaluate innovation projects, the TCOS framework further elucidates the importance of evaluating factors, such as environmental issues, which relate to socio-political legitimacy.

The next chapter presents the methodology and data collection process for designing the SIA tool and choosing relevant criteria grounded in sustainability research and contextualized for the case company.

3. METHODOLOGY

The research elements should be aligned and have a high methodological fit for a quality research project within management field research (Edmonson & McManus, 2007). This chapter describes the research design and phases to ensure compatibility amongst the research questions and methodology. The research philosophy guides the research process, and the ontological and epistemological viewpoints support defining the research strategy and design (Eriksson & Kovalainen, 2008). Therefore, this chapter will first explore the research philosophy, after which the research design will be presented. Subsequently, the data collection steps will be described, and the chapter will be completed with a discourse on the trustworthiness of this study and relevant ethical considerations.

3.1. Research philosophy

Ontology examines the relations between people and societies and how realities are constructed (Eriksson & Kovalainen, 2008). Eriksson and Kovalainen (2008) discuss two ontological starting points: constructionism and objectivism. In constructionism, reality is created through social constructs and interactions, while in objectivism, a worldview separate from human interactions and activities exists (Eriksson & Kovalainen, 2008). Although research cannot be entirely objective or separated from social reality, this study's appropriate ontological standpoint is an objectivist one. This study examines the decision-making procedures within the case company and focuses on assessing the sustainability impact of innovation projects. Therefore, the gathered primary data from interviews are descriptions of company procedures and sustainability considerations regarding the projects rather than subjective experiences, views, or opinions.

Perceptions of the projects' sustainability impact can vary due to the intrinsic, fuzzy and value-based nature of sustainability (Lankoski, 2016). This study aims to understand how to assess sustainability by understanding the projects and relevant sustainability criteria within the case company context. Thus, by adopting an objectivist ontological starting point, the research process can support designing an SIA tool that is suitable for various innovation projects and not entirely constrained to social interactions and social views on sustainability.

Furthermore, epistemology is 'the study of the criteria by which we can know what does and what does not constitute warranted, or scientific, knowledge' (Duberley, Johnson & Cassell, 2012: 16). Hence, epistemology centers around the questions: 'What is knowledge and what are the sources and limits of knowledge?' (Eriksson & Kovalainen, 2008: 14). Within epistemology, there are several directions one can take (Eriksson & Kovalainen, 2008). This thesis aligns with critical realism as it assumes 'the existence of an objective ('intransitive') world that has powers and properties that can be more accurately known as a consequence of scientific endeavor' (Vincent & O'Mahoney, 2018: 201). This approach also acknowledges that knowledge about the world is socially construed depending on the circumstance and timing (Eriksson & Kovalainen, 2008). As the concept of sustainability and what constitutes sustainable has changed (Mebratu, 1998) and continues to change, this study will also adopt the stance that the historical context and social interpretations largely affect the researched topic and its meaning.

3.2. Qualitative research design

As the given topic has not yet been researched thoroughly and could benefit from new in-depth data and comprehensive analysis with practical examples, the study will be conducted with qualitative research methods (Yin, 2012). This research method allows for a detailed understanding of how companies operate and make decisions about potential innovation projects and how they perceive sustainability and operationalize it.

The research method and suitable theory of the study depend on the research questions as the collected data should answer the research questions. Therefore, it is important to define the purpose of the study and research questions before choosing the data gathering method (Eriksson & Kovalainen, 2008). To recount, the purpose of this study is to create an SIA tool that organizations can use in the decision-making process of innovation projects. It is specific to new types of R&D projects that companies are increasingly undertaking and follow agile working models, design thinking, incubation and acceleration processes and involve stakeholder collaboration. The research questions are presented in the Introduction-chapter of this study and repeated in Figure 11 below.

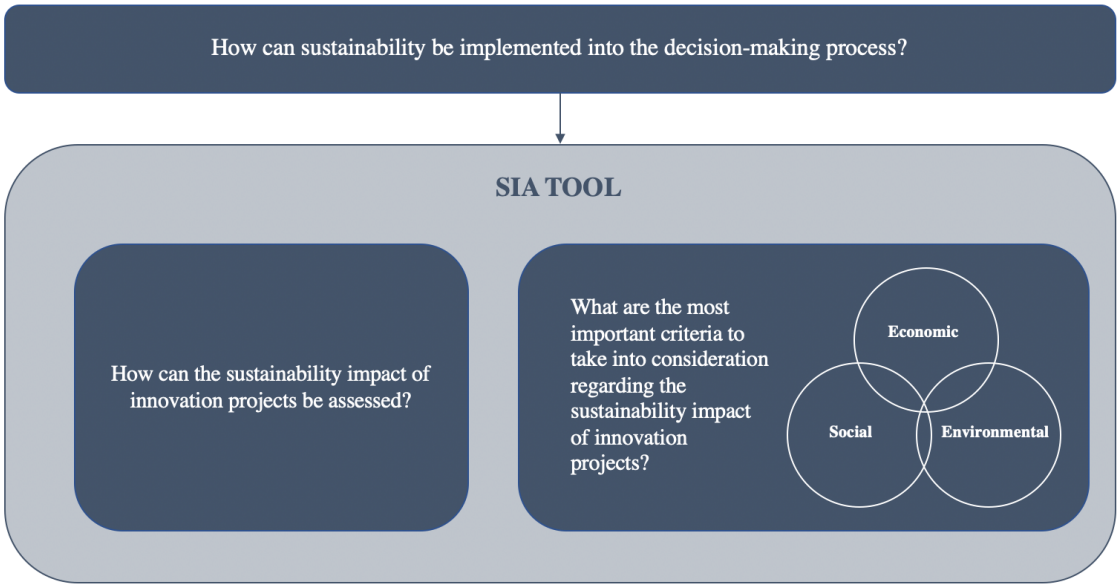

Figure 11: Research questions of this thesis

As discussed in the literature review, sustainability assessment can be used to implement sustainability into decision-making. The sustainability impact of innovation projects can be assessed through an SIA tool, which will also be created for this study's case company. The case company officially views sustainability through the three dimensions of sustainability (environmental, social and economic). Hence, the criteria to appropriately assess the sustainability impact of innovation projects will be aligned with the triple bottom line definition of sustainability.

3.3. Case study research

Given this study's purpose and research questions, the chosen research tradition is a case study since it offers an avenue for thick description, 'interpretation of meaning, and understanding of the case' (Eriksson & Kovalainen, 2008: 117). In this particular case, the company represents a multinational corporation undergoing a digital transformation and emphasizes sustainability in its mission. By gaining an overall and detailed understanding of the decision-making process and sustainability operationalization within this type of company, the phenomenon of sustainable digital transformations can be better understood. Eriksson and Kovalainen (2008: 116–117) also note that 'case study research is presented as

a research strategy when addressing complex organizational, managerial, and other business issues, which are considered difficult to study with quantitative methodologies'.

The research questions guide the data collection methods and the conduction of the study. In case study research, the intention is to answer the research questions through the case (Eriksson & Kovalainen, 2008). The appropriate type of case study research for this study is intensive case study research. Intensive case study research focuses on 'understanding a unique case from the inside by providing a thick holistic and contextualized description' (Eriksson & Kovalainen, 2008: 118). It is suitable because the emphasis is on the uniqueness of the case and the research process rather than an existing theory. The main interest is gaining insights through different stakeholders immersed in the case company (Eriksson & Kovalainen, 2008). Case studies are also especially appropriate for producing knowledge useful in management (Gibbert, Ruigrok & Wicki, 2008). Nonetheless, it is essential to maintain rigor in case study research (Gibbert et al., 2008). Thus I, as the researcher, will do my best to ensure that a logical, coherent common thread is presented throughout this study in order for the audience to understand and accept the results of this thesis (Gibbert et al., 2008).

3.4. Data collection methods and case company

Data collection for case study research often involves different records, observations, interviews and surveys (Eisenhardt, 1989). For the analysis and data to be robust, triangulation of data is encouraged (Eriksson & Kovalainen, 2008; Gibbert et al., 2008; Farquhar, 2012). Thus, data for this study was collected through semi-structured interviews, unstructured interviews and digital archives.

Semi-structured interviews were the primary interview method as they are suitable for business research that attempts to answer "how" and "what" questions (Eriksson & Kovalainen, 2008). Furthermore, having similar questions for interviewees helps the comparison and analysis of the answers. Unstructured interviews were also conducted as the relationships between the researcher, I, and the participants were often familiar and existed beyond the study. The conversations could flow more freely by having unstructured interviews, uncovering perspectives not known to me prior (Eriksson & Kovalainen, 2008).

Also, creating the SIA tool and defining the criteria involved collaboration and iteration rounds with the sustainability and innovation managers. The iteration rounds with sustainability managers were important to ensure the accuracy of the sustainability assessment criteria. Whereas, the discussions with innovation managers were important to collect feedback on user experience and the level of difficulty for non-experts using the SIA tool.

3.4.1. **Case company and interviewees**

The research context is a large Finnish multinational company operating in the manufacturing and service industry. Due to the case company's request, the case company will remain anonymous in this study. Like various other companies in Finland, this company is undergoing a digital transformation and emphasizes sustainability in its performance and solutions. As the researched topic is an overarching theme within the business world (Bughin & Woetzel, 2019), the data and results can be applied to other organizations.

The interviewees and examined projects were chosen through purposive sampling. In purposive sampling, the interviewees and projects are intentionally decided on the basis of the research objectives and anticipated inputs of the interviewees (Eriksson & Kovalainen, 2008; Etikan, Musa & Alkassim, 2016). The chosen projects were innovation projects that had undergone the company incubation process. Additionally, in an attempt to represent all types of possible projects, the chosen projects were deliberately quite different, and the role sustainability played within them varied. Purposive sampling relies heavily on finding interviewees who are knowledgeable about the subject and willing to be interviewed and have strong communication skills (Etikan et al., 2016). Thus, the interviewees were also determined based on their position and understanding of the projects, decision-making processes, and/or sustainability.

Three projects were chosen to be examined as this approach warranted comparison and ensured a reasonable scope for a graduate thesis study. Within each project, the product owner (the project lead) was extensively interviewed. Product owners are the designed end-users of the SIA tool. Gauging their understanding of sustainability, sustainability considerations within the projects, and prioritization decisions regarding the projects, was

important in addressing the research question: *How can the sustainability impact of projects be assessed*?.

Moreover, the case company's sustainability managers were interviewed and engaged throughout the research process on multiple occasions. The sustainability managers are in charge of sustainability reporting and setting high-level sustainability targets on the organizational level. They were interviewed and discussed with to ensure the sustainability criteria were sufficient, accurate and aligned with the high-level strategic sustainability goals. The first interviews were semi-structured, while the following meetings were less formal and longer unstructured interviews regarding the criteria and wording.

The general manager of open innovation was also interviewed and engaged with multiple times throughout the research. Within the case company, the general manager is in charge of evaluating the project ideas and facilitating the decision-making of which ideas move forward to the accelerator and are further incubated. There are currently various assessment tools and criteria used to determine the value of different projects. Therefore, interviewing the general manager gave insight into how the projects are being assessed and how an SIA tool could be implemented into the decision-making process.

During the SIA tool creation phase, one project was chosen for further examination to test the tool and act as an example for other sustainability assessments. Three project members were chosen to experiment with the tool to ensure that the assessment generated similar results regardless of the person completing it. As sustainability has been argued to be value-based, and the knowledge on sustainability varies (Lankoski, 2016), different people may have different perceptions of how sustainable the projects are. This can result in misconstrued understanding and communication of the actual sustainability impact of the projects.

Additionally, the product owner of a fourth project was asked to test the SIA tool to evaluate the project they were currently working on. The fourth project and product owner leading it were both unrelated to this research. The experiment was executed to ensure that the tool was user-friendly and the sustainability criteria were clear, even to someone who had not

been involved in developing it. Since the fourth product owner was not familiar with the SIA tool, they could provide important unbiased insights into its difficulty or ease.

The interviewees ranged from project workers to managers. Mostly, the sample consisted of managers, product owners or other senior-level persons. The interviewees' employment period within the company varied between a few months to decades, and the interviewees were mostly male. Interviews with three out of four product owners were conducted via Skype, while one was conducted face-to-face. Interviews and discussions with the general manager were conducted via Skype and face-to-face. All interviews with the sustainability managers were conducted face-to-face. Altogether, a total of 12 interviews were conducted in building the data and testing the developed tool.

For the semi-structured interviews, English was used as the interview language. During unstructured interviews and discussions, the spoken language was often Finnish. The interviews were conducted between December 2018 and June 2019, and the semi-structured interviews were transcribed word-for-word, while the unstructured interviews were summarized after the interviews.

3.4.2. **Data collection stages**

The objective of the research was to examine the topic in-depth and create an SIA tool. Therefore, it was beneficial to complete the data collection in multiple stages; first to gain an understanding of the decision-making process and sustainability measurement tools within the organization; second, conduct extensive interviews with the product owners and understand the innovations projects that are to be assessed by the SIA tool; and third, have the tool tested before launching it. The different stages are outlined in further detail below.

Stage one

In the first stage, semi-structured interviews were conducted with the organization's sustainability managers and general manager of open innovation. The sustainability managers were interviewed to understand the organization's sustainability targets, criteria and measurement practices. If the organization had an existing SIA framework readily available, creating another one would have been unnecessary. Additionally, the general

manager of open innovation was interviewed due to their position in the case company's accelerator. The interview's objective was to gain a holistic picture of the types of existing innovation projects and the decision-making and incubation process within the organization. The general manager then suggested three projects to be examined further for this study. To capture insights of different types of projects, the chosen projects all differed from one another regarding the solution they provided, and the role sustainability played in them.

Stage two

During the second stage, the product owners of the three innovation projects were extensively interviewed in the form of semi-structured interviews. The interview questions were the same for all product owners. Additionally, various unstructured interviews and informal discussions were held regarding the SIA tool's scope and design with directors and senior-level managers in the company. This stage also entailed the meticulous examination of digital archives, including digital materials detailing the projects, organizational sustainability measures, and company strategies. The sources of the gathered information were the company's sustainability reports and other internal, non-classified documents regarding the decision-making process of innovation projects, sustainability targets, and strategies to make the case study more substantial and convincing (Eriksson & Kovalainen, 2008).

Stage three

With the data gathered during the first two stages, an initial version of the SIA tool was created. During the third stage, the initial sustainability criteria were negotiated and co-created with the sustainability managers. Three members from one of the three examined innovation projects then tested the SIA tool. The results were analyzed to determine whether they provided consistent findings. Moreover, a fourth product owner of an innovation project unrelated to this study tested the tool.

The interview methods, interviewees and objectives are listed below in Table 4.

Table 4: List of interviews used for data gathering and testing the SIA tool

Interviewee	Interview type	Objective of interview	Research questions related to interview	Data collection stage
General Manager of Open Innovation	Semi-structured interview	Understand the criteria and decision-making process behind selecting ideas to become innovation projects in the company accelerator	How can sustainability be implemented into the decision-making process? What are the most important criteria to take into consideration regarding the sustainability impact of innovation projects?	First stage of primary data collection
Sustainability Managers of corporation (2 persons)	Semi-structured interview	Understand the organization's current and future sustainability targets and assessment mechanisms	How can sustainability be implemented into the decision-making process? How can the sustainability impact of potential innovation projects be assessed?	First stage of primary data collection
	Unstructured interview	Co-create and modify the sustainability criteria for SIA tool	What are the most important criteria to take into consideration regarding the sustainability impact of innovation projects?	Third stage of primary data collection
Product Owner of Project A	Semi-structured interview	Gauge the level of general sustainability knowledge and considerations within the project and decision-making	How can the sustainability impact of potential innovation projects be assessed? How can sustainability be implemented into the decision-making process?	Second stage of primary data collection
	Unstructured interview (qualitative data), testing of the SIA tool (quantitative data)	Test the SIA tool and compare results amongst project members	How can the sustainability impact of potential innovation projects be assessed? How can sustainability be implemented into the decision-making process?	Third stage of primary data collection
Product Owner of Project B	Semi-structured interview	Gauge the level of general sustainability knowledge and considerations within the project and decision-making	How can the sustainability impact of potential innovation projects be assessed? How can sustainability be implemented into the decision-making process?	Second stage of primary data collection
Product Owner of Project C	Semi-structured interview	Gauge the level of general sustainability knowledge and considerations within the project and decision-making	How can the sustainability impact of potential innovation projects be assessed? How can sustainability be implemented into the decision-making process?	Second stage of primary data collection
Project members of Project A (2 persons)	Unstructured interview (qualitative data), testing of the SIA tool (quantitative data)	Test the SIA tool and compare results amongst project members	How can the sustainability impact of potential innovation projects be assessed?	Third stage of primary data collection
Product Owner of Project D (fourth unrelated project)	Unstructured interview, observation and testing of the SIA tool	Test the SIA tool in an unbiased setting, observe the product owner filling it out and receive comments on the tool	How can the sustainability impact of potential innovation projects be assessed?	Third stage of primary data collection

In addition to the structured and unstructured interviews listed in the table above, further unstructured interviews were conducted as I, the researcher, had relatively free access to the employees. This allowed me to have informal conversations about the research topic with relevant and non-relevant stakeholders. Eriksson and Kovalainen (2008: 78) point out that 'qualitative interviews may also resemble everyday conversations, in which the distinction between the interviewer and the interviewee is not so evident'.

The conversations and unstructured interviews not listed in the table were arranged to engage with employees that were not directly involved in innovation or sustainability projects. By engaging with a wider group of stakeholders, I could gather employees' thoughts on SIA and the importance of sustainability within their work and decision-making. This was proven useful to contribute to observations on the areas an SIA tool could be used and applied to in addition to the initial purpose.

3.5. Data analysis

There are two common strategies for analyzing data. The former builds upon 'pre-formulated theoretical propositions and a respective coding system' (Eriksson & Kovalainen, 2008: 129), while the latter inductive strategy focuses on advancing the case description. The chosen data analysis strategy for this research is an inductive strategy. This strategy allows the researcher to 'extract from the natural variation of the empirical data, not from a pre-given theoretical framework or a set of pre-formulated propositions' (Eriksson & Kovalainen, 2008: 129). As a result, themes and common thoughts are extracted from the data (Farquhar, 2012). Additionally, the research questions are further refined in the analysis phase and the trustworthiness of the research is constantly examined (Eriksson & Kovalainen, 2008). A benefit of conducting case study research is the level of adaptability throughout the research. Qualitative research allows for analysis throughout the process, rather than merely at the end of the data collection process (Farquhar, 2012). Thus, an inductive strategy is appropriate for a case study research and will be implemented in six stages.

Based on an inductive strategy, this study uses thematic analysis to understand and structure the data. It is a popular method in organizational research but widely used in various other

fields as well (King & Brooks, 2018; Cassell & Bishop, 2019), such as psychology (Braun & Clarke, 2006). Braun and Clarke (2006: 79) define thematic analysis as a 'method for identifying, analysing and reporting patterns (themes) within data. It minimally organizes and describes your data set in (rich) detail'. A coding mechanism is needed to handle and structure the data (Eriksson & Kovalainen, 2008; Farquhar, 2012). Farquhar (2012) suggests having different levels of coding. Braun and Clarke (2006) provide six phases as guidance for conducting thematic analysis that will be used in this study. Braun and Clarke's (2006) phases and explanations can be seen in Table 5 below.

Table 5: Phases of thematic analysis (Braun & Clarke, 2006)

Phase	Description of the process
1. Familiarizing yourself with your data:	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2. Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes:	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5. Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
6. Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

The following sub-sections will go over each phase and explain how it was conducted within the context of this case study.

Phase 1 – Familiarizing yourself with your data

This phase relates to noting down the data and internalizing it (Braun & Clarke, 2006). As mentioned earlier, I transcribed all of the semi-structured interviews and wrote down primary comments, ideas and thoughts after each semi-structured interview, unstructured interview and discussion. Afterwards, I read through the interview transcripts multiple times and added more comments to my notes each time.

Phase 2 – Generating initial codes

In the second phase, the first versions of the codes are formulated (Braun & Clarke, 2006). I began creating initial codes based on the collected data from stages one and two of my research. I derived the codes from the semi-structured interviews and placed supporting data extracts alongside them. Some of the data extracts were suitable for multiple initial codes.

Altogether I uncovered 40 initial codes, which included one or more corresponding data extracts. A few of the initial codes and evidential data extracts are shown in Table 6.

Table 6: Examples of the initial codes of the data analysis

Initial Codes	**Data Extracts**
Innovation project ideas' criteria do not currently include sustainability considerations	*…[Project ideas] are aligned with our overall strategy or the company-wide strategy as well as individual business' strategy and then it is about the potential a certain idea has…* *...How complex it [project idea] is, how much potential there is and...is there an existing client?...* *…We have a definition for sustainability, but it is not consistently used as an evaluation criterion for projects…* *...All the time systematic work ongoing within R&D but not all of them have [sustainability targets]...*
Lack of knowledge amongst project managers and workers regarding sustainability evaluation	*...Not really [sustainability evaluation knowledge] because the evaluation impact and the evaluation criteria are not consistent…* *...There is a significant difference whether you talk about people in Northern Europe where sustainability in general is a topic that people have fairly good understanding of and compare it to say Asia where it is a much newer area in many respects…*
Sustainability is a communication point throughout projects only if the projects are specifically about sustainability	*...Of course, if a project is about sustainability, we are using that as one area which we do communicate but it is not a consistent area of communication…* *…We do [discuss sustainability within the team frequently]. Also, because sustainability is one of the key elements of the value proposition for Customer X. … So, it is something that we always stress a lot in our presentations and in our calculations…* *…We have not used the word sustainability, but I must say that with my team we really all share the same vision of helping our colleagues. So, probably indirectly we have done it. We have not used the word sustainability, as I said. But you know, we clearly are driven by this goal of how we help all employees in this transition...* *...No, not at all [sustainability as a communication point]… And I do not really see the direct connection [of the project] to sustainability unless it's through the products…*

Phase 3 – Searching for themes

In the third phase, the initial codes are grouped under common themes, and all other available data is concentrated within the themes (Braun & Clarke, 2006). Thus, I combined codes

with similar meaning under three themes, which were left intentionally broad: *Sustainability, Case company*, and *Sustainability evaluation*. As there were 40 initial codes, I created sub-themes to support the broad themes. The initial codes extracted in the second phase were placed into the sub-themes. Each sub-theme consisted of several codes, initially varying from six to 21. In this phase, as a means of triangulation, I gathered the collected primary data from the company's digital archives related to the sustainability strategies, communication, and reports. I then cross-reviewed the themes with the digital archives' data to ensure consistency and accuracy within the identified themes.

An example of the theme, *Sustainability evaluation***,** with the sub-themes and initial codes, can be seen in Table 7. The other themes follow a similar thematic mapping process.

Table 7: Example of the sub-themes and initial codes of the theme Sustainable evaluation

Themes	**Sub-themes**	**Codes**
Sustainability evaluation	*Environmental sustainability*	Project sustainability criteria should evaluate the impact to the environment Project sustainability criteria should evaluate how quick is the impact Three different levels to address environmental sustainability Project sustainability evaluation should assess what areas are affected
	Social sustainability	Project sustainability could evaluate impact to society if relevant
	Economic sustainability	Economic sustainability is not necessarily relevant in such an impact assessment tool
	Magnitude of impact	Project sustainability should evaluate how large the impact is
	Must-haves and nice-to-haves	Evaluation criteria could have must-haves and nice-to-haves
	Sustainability is not easily understood	Criteria have to be limited if end users of assessment tool are not sustainability experts Some sustainability education is necessary

Phase 4 – Reviewing themes

As the fourth phase relates to reviewing the themes (Braun & Clarke, 2006), the sub-themes and themes were critically reviewed based on their suitability for the SIA tool and sustainability criteria, in addition to their accurate representation of the data. Sustainability managers and the general manager of open innovation within the case company further

assessed the themes, sub-themes and codes to ensure their relevance to the specific case and how they reflected the collected data. One of the main processes in this phase was ensuring the data extracts from the initial codes aligned with the iterated themes. The wordings of the three main themes, as well as sub-themes, were refined. Additionally, certain codes were rearranged to other themes.

The three final themes are *Sustainability Drivers and Obstacles, Case Company and Sustainability*, and *SIA Tool for Innovation Projects*. Altogether there are 12 sub-themes, each of which contains one or more supporting code. Table 8 shows an example of the theme *SIA Tool for Innovation Projects* with its final sub-themes and codes.

Table 8: Theme "SIA Tool for Innovation Projects" with final sub-themes and codes

Themes	**Sub-themes**	**Codes**
SIA Tool for Innovation Projects	*Innovation projects and sustainability*	Sustainability is not consistently communicated or evaluated unless it is a focal point of project Employees lack knowledge on how to assess projects' sustainability Sustainability should be assessed and added as a criterion
	Environmental sustainability	The impact to the environment should be evaluated The temporal effect to the environment should be measured
	Social sustainability	The impact to society should be evaluated when relevant
	Economic sustainability	Economic sustainability is not relevant in such an impact assessment tool
	Other factors	The magnitude of the project's impact should be evaluated Evaluation criteria could have must-haves and nice-to-haves The criteria have to be limited if end-users are not sustainability experts

Phase 5 - Defining and naming themes

In this phase, the themes are further reviewed and refined for clarity (Braun & Clarke, 2006). I developed the initial SIA criteria under three umbrella themes (sub-themes in the data): social sustainability, environmental sustainability and economic sustainability. The criteria were created through a combination of insights and data from the interviews, digital archives, and extant literature and sustainability assessment tools. For each criterion, the definitions and examples were clarified and checked with the sustainability managers of the case company in a meeting setting. Thus, the chosen criteria aimed to include sustainability

elements that are widely included in sustainability measurements as well as criteria specifically relevant to the case company context. Table 9 lists the criteria as well as their explanations or examples.

Table 9: The initial SIA criteria of the three umbrella themes

Sub-themes	**Criteria**	**Explanation/Example**
Economic sustainability	*Organization's leadership position in sustainability*	Being a forerunner in sustainability, having a high ranking in sustainability ratings, being included in impact investing funds
	Organization's brand image	Public's perception of the organization's sustainability
	Economic well-being of local society	e.g., jobs creation and income generation especially in communities where there is slowed down economic growth/activity
	Societal infrastructure	e.g., providing electricity in a location with previously unreliable production
	Knowledge infrastructure	Enabling creation and distribution of knowledge, data and understanding in the context of open innovation
Social sustainability	*Safety of industry*	Systemic level change of the industry/ecosystem and/or change of common standards within the industry
	Safety of products/services/ solutions	Safety and security (e.g., physical safety and cyber security of operating products or change in part of the system)
	Responsible business practices (in relation to externals)	Includes anticorruption practices, code of conduct implementation, responsible extraction of raw materials, supply chain management, anti-discrimination
	Employee well-being; development, occupational health or safety	Satisfaction and enjoyment in the workplace, fair and equal treatment, safe working environment, trainings, possibility of development, zero accidents
	Health and well-being of local communities	Local community's well-being and health, e.g., through stakeholder collaboration with local government or reduced pollution
Environmental sustainability	*Emissions (to water or air)*	Includes pollution, non-greenhouse gases (GHG) and GHG, e.g., CO_2, NO_x, SO_x.
	Use of renewable energy sources	e.g., solar, wind power or geothermal power
	Efficiency	e.g., less consumption of fresh water, energy or other resources
	Biodiversity	e.g., sustainable land use, preservation of species and aquatic ecosystems. Be especially aware if you operate close to a nature preservation area on land or water!
	Circular economy thinking	Includes recycling, upcycling, remanufacturing, refurbishing, reselling, replenishing, sharing, repairing, restoring, repurposing, reusing, recovering

Phase 6 – Producing the report

According to Braun and Clarke (2006), the last phase entails creating an academic report of the data analysis and refining the chosen extracts. In this thesis, the findings, which act as the data analysis report, are presented in the Empirical findings -chapter. Moreover, a meaningful discussion between the research questions, literature review and collected data is held in the Discussion -chapter.

3.6. Trustworthiness of the study

According to Eriksson and Kovalainen (2008), the researcher must continuously evaluate the research, quality, and trustworthiness to ensure the scientific disposition of the study. The authors provide a framework consisting of three concepts to evaluate the study: 'reliability, validity and generalizability' (Eriksson & Kovalainen, 2008: 291). Reliability relates to the consistency of the research. The study is considered reliable if another researcher conducted a similar study and came to the same conclusions. In qualitative research, this is not as clear-cut as in quantitative research; however, it is still important to keep it in mind (Eriksson & Kovalainen, 2008). In this study, reliability is strengthened by testing the SIA tool with several members working on the same project to detect whether the SIA results vary depending on the user.

The second idea is validity, which indicates the degree to which the research findings aptly represent or explain what happened (Eriksson & Kovalainen, 2008). Although validity as an evaluation method is arguably more appropriate for quantitative research, it can be valuable for qualitative research evaluation as well. In this case, the goal is to give assurance that the study or depiction is accurate (Eriksson & Kovalainen, 2008). Validity can be increased through triangulation, which is used in this study. This study includes a triangulation of data (use of various data sources) and triangulation of methods (use of different methods to corroborate findings) (Eriksson & Kovalainen, 2008).

Finally, generalizability refers to whether the findings of a study can be applied to a broader context in some manner (Eriksson & Kovalainen, 2008). Single-case study research has been criticized as a means for producing generalized results. However, the argument that single-

case studies are weaker than multiple-case studies is not always accurate. A majority of them are still multiple since theories and data can be connected in various respects (Flyberrg, 2010). Furthermore, in this study, case study research was deemed the appropriate type of research due to the uniqueness of the case, and the aim was not to create entirely generalizable results. However, the case company represents a multinational, incumbent firm undergoing similar digital and sustainability disruptions as many others in the same industry and other industries. Thus, the resulting SIA criteria can be used in other organizations and settings, making the results generalizable to a certain extent.

Moreover, Eriksson and Kovalainen (2008) explain that case study research can be evaluated. The quality can be ensured by confirming that the case study is significant and complete and that the studied issue is relevant and of interest. In this study, the case can be considered unique as there is a research gap in multinational companies' innovation departments' SIA. The subject is relevant and timely since sustainability is a current megatrend in business and society (Derqui, 2020). In practice, the studied issue can provide other companies with a means to evaluate their projects' sustainability impact.

To ensure that the study is complete, all pertinent information for the study must be collected. In other words, the study can be said to be complete once sufficient results have been reached (Eriksson & Kovalainen, 2008). In this thesis, the case study was deemed complete once an appropriate, usable SIA tool was created and tested. The SIA tool was intended to be an early version and subsequently iterated during the use phase after gathering sufficient feedback. As this is not a longitudinal study, I could not continue iterating the tool throughout the following years. In conclusion, the aim was to create an SIA tool, and the study was completed once this was achieved.

3.7. Ethical considerations

There are overarching ethical practices that all research must adhere to, such as avoiding plagiarism, professional integrity, and ensuring participants' privacy (Eriksson & Kovalainen, 2008). In this chapter, I will discuss the ethical considerations that are specific to this research study.

As mentioned previously, I have collegial relations with the interviewees, and the research study data relies on supplementary observations and informal discussions. Consequently, a relevant ethical consideration is ensuring the interviewees understand that they are providing data to the research study during informal discussion settings. In traditional research with data collection methods, such as structured interviews, it is comparatively apparent to participants when they provide data to the research. However, in case study research with informal elements, it can be less clear (Shaw, 2010). Therefore, I made sure to ask for consent before recording any conversation and used semi-structured interviews for explicit data. Informal discussions and observations were used to make adjustments to the research, choose the project cases within the case study, select the interviewees, and gather sources from which to find relevant digital data. Informal discussions and negotiations regarding the SIA tool and selected criteria were also unstructured and unrecorded. However, the managers involved were made it clear that the SIA tool and criteria would be used for this graduate thesis.

Eriksson and Kovalainen (2008) also highlight the importance of protecting the anonymity of the interviewees in a business context, especially when the researcher has a relationship with the interviewees. As the subject matter is not sensitive and the collected data is concerned with understanding decision-making processes, sustainability considerations, and the projects themselves, rigorous protection of employees' anonymity is not a crucial factor. However, some interview questions revealing the interviewees' opinions on the company's sustainability focus or lack thereof could reveal employee dissatisfaction and disappointment. In these cases, additional care of employee anonymity was taken by not revealing the interviewees' job titles in the findings.

Furthermore, if the research is sponsored, it must be explicitly stated. Eriksson and Kovalainen (2008) see that one of the ethical issues of sponsorship can be a bias towards a specific research paradigm. This can be overcome by a critical review of the research setting and methods and consultation with an academic supervisor, and justification of chosen methods and data. Thus, I made it known to the participants, academic supervisor, and the public that the case company sponsored this thesis.

4. EMPIRICAL FINDINGS

This chapter will introduce the empirical findings in the order of the identified themes: S*ustainability drivers and obstacles, Case company and sustainability,* and *SIA tool for innovation projects*. Within these themes, findings regarding the sub-themes are presented with supporting data extracts. The presentation of these vivid data extracts helps understand the chosen themes, codes and analysis. To maintain the interviewees' anonymity, their job titles will not be linked to the quotes. Instead, they will be referred to as Interviewee A–F. Also, the name of the case company is replaced with Company X, and the name of a customer is replaced with Customer X.

4.1. Sustainability drivers and obstacles

The sub-themes and codes in this theme relate to elements that can enhance or hinder sustainability focus and widespread adoption within the organization. The sub-themes are *Different perceptions of sustainability*, *Business case for sustainability,* and *Systemic change.* The drivers and obstacles in this theme can be generalized to various companies and industries. Thus, they are classified as external drivers and obstacles. The next chapter then focuses on internal drivers and obstacles that are more specific to the case company itself.

4.1.1. Different perceptions of sustainability

Interviewees gave varied definitions and perceptions of sustainability. The variety of sustainability meanings is consistent with the findings from the literature. All interviewees emphasized environmental sustainability, possibly because it is the core focus of the case company. Economic sustainability was not mentioned as a focal point. The responses were not necessarily contradicting one another but instead showcased the subjective nature of defining sustainability.

'The first thing that comes to my mind if I think about the word sustainability is the environment. How do we treat the environment in a sustainable way? How do we reduce pollution, reduce CO_2, recycle, etc.? So, the environmental aspect is very, very big, and it is probably the first thing that really comes to mind. The very, big green dot. … Also, for instance, crime rate, kids dropping out of school, child mortality and welfare in general. So, that is actually a big side of sustainability in my mind.' – Interviewee A

'Well of course sustainability can mean a lot of things. It can be social sustainability, environmental sustainability and so forth.' – Interviewee C

'For me, sustainability is very much connected to environmental issues, but I know that we also have other aspects, like social aspects and some also connected to communication in a way. But for me, it [sustainability] is the environment and environmental impact.' – Interviewee F

The interviewees' comments highlight the need to provide clear definitions for sustainability and the criteria in order for the SIA tool to be used in the intended and consistent manner.

4.1.2. **Business case for sustainability**

Interviewees explained how financial and commercial viability still largely determine the company activities and thus set a boundary condition. As discussed in the literature, companies consider sustainability to the extent that it makes financial sense and serves a business case. The interviewees share similar views around this and believe that financial incentives prompt business activities. In today's social and political climate, sustainability is topical and considered necessary in conducting business. Hence, having a business case for sustainability is a significant driver for implementing sustainability in the organization.

'When there is a finance drive behind things, they happen in a much better way. That is why most probably the current green revolution in the energy business will happen because it now makes financial sense for companies to invest, right? As long as it was … more for the image, it was not really getting pace.' – Interviewee A

'If Company X wants to be a credible and successful company also in the future, it is also smart business what we are doing right now [acting sustainably]. When you think of the expectations of society at large, then we have to be a forerunner.' – Interviewee B

The interviewees see a business case for sustainability in the present and in the future, driving the change towards sustainable development. An overall acceptance of sustainability as a sensible business practice can accelerate the demand and use of an SIA tool for decision-making.

4.1.3. **Systemic change**

Interviewees expressed that large-scale deployment of sustainable solutions requires systemic change. Sustainability transitions offer the company an opportunity to set itself apart as a forerunner in its industry and push for systemic change at large. Concurrently, the dependency on systemic change hinders the case company's efforts, as the industry is not moving as quickly towards embracing sustainable solutions, impacting the company's pace and scale in deploying these solutions.

'We want to make a difference through our operations and also the whole. The influencing work is to make a difference, try to get policy-makers understand … that we want to make a difference, system level changes... Through that we can make a much bigger difference than just through one single product.' – Interviewee B

'The industry status quo would need to change before this [a sustainability improving solution within their project] can be implemented and scaled.' – Interviewee C

To ensure that this study's SIA tool is aligned with the industry changes, the tool should include elements relevant to systemic changes happening currently and in the foreseeable future.

4.1.4. **Summary of findings: Sustainability drivers and obstacles**

The findings of the theme show that different actors have mixed perceptions of what sustainability is. Lacking a common understanding and aim for sustainability can hinder focused sustainability efforts. Having a clear business case for sustainability acts as a driving force since sustainability activities make financial sense. Finally, the overall systemic change and ongoing sustainability shift on a societal and industrial level drive the company to keep with the times and advance sustainability. On the contrary, lack of wider systemic change also stalls the pace of change that the company would like.

4.2. Case company and sustainability

The findings in this chapter present the sub-themes and codes that relate to the case company and its sustainability efforts. The covered sub-themes, *Sustainability targets, Industry leadership, Role of sustainability in decision-making,* and *Employees and sustainability*, can all be viewed as sustainability drivers or obstacles. The previous chapter covered

sustainability drivers and obstacles that can be perceived as generic to companies in the industry. In contrast, this chapter's sub-themes are specific to the case company, regardless of possible similarities with other companies. Therefore, the presented factors are considered to be internal influences. The findings presented in this chapter introduce material from digital archives and sustainability reports in addition to the data collected from interviews.

4.2.1. **Sustainability targets**

The case company's website, sustainability reports, and digital archives show that the company aligns its sustainability definition and goals with the triple bottom line approach. This approach includes three sustainability dimensions: economic, environmental and social sustainability. For the case company, overall sustainability is built on the foundation of strong economic sustainability. The main sustainability targets for each dimension are visualized in Figure 12.

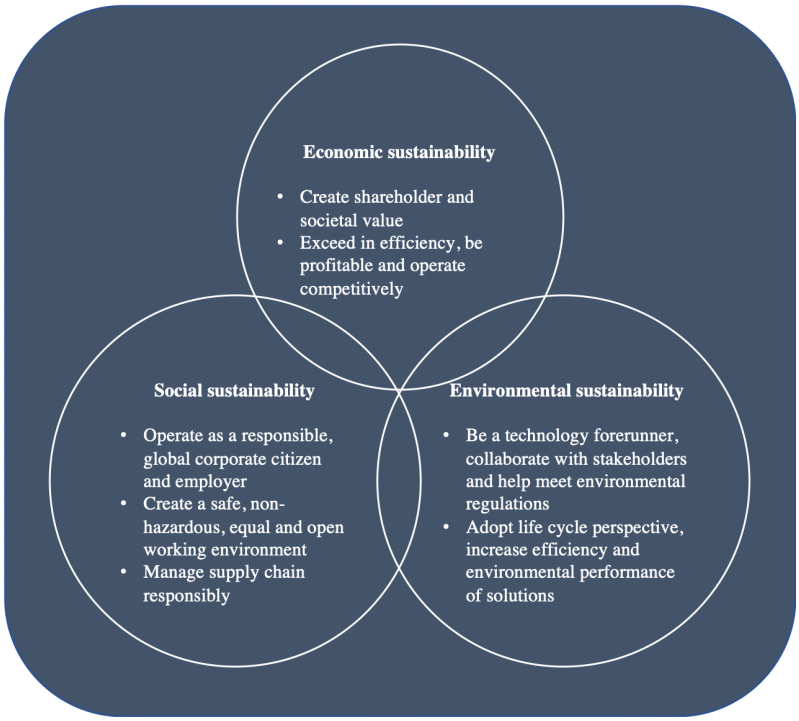

Figure 12: Official sustainability targets of the case company

All interviewees expressed that improving environmental sustainability is the company's main sustainability target. This was further emphasized in the interviews with the sustainability managers of the company. Economic sustainability lays the foundation for the company, but environmental sustainability has the most attention in terms of sustainability

targets and societal impact. Social sustainability is seen as relevant but does not have the same focus as it is not considered part of the company's core business.

'Of course, we tend to focus mostly on environmental sustainability because that is where we can have the biggest impact.' – Interviewee C

'If you look at our sustainability targets on our website, ... it is on the operations side. It has been more about energy efficiency, energy savings. ... I would say that our emphasis is clearly on providing environmentally sound solutions. ... The social side of sustainability is not in our core business, but of course, it gives us the social permit to operate and act on many different levels. ... Responsible business creates a good reputation, minimizes risks related to strikes and legal cases and so on.' – Interviewee D

In addition to covering all sustainability dimensions, it is challenging to define sustainability targets that are then operationalized. The case company struggles with defining sustainability targets and translating them from high-level goals to concrete and understandable goals for employees to strive towards within their daily work. The company-wide sustainability targets are not communicated nor clear for all employees, even though they are prominent in the sustainability reports for other stakeholders.

'All the time, systematic work is ongoing within R&D, but not all of them have [sustainability targets] ... I do not think everyone is aware of the sustainability targets. It is something that is in the report, but not all of them are necessarily even well-known.' – Interviewee B

'There are a lot of things that could be done better [regarding sustainability targets]: could be more strategic, could be something that the businesses themselves take within.' – Interviewee D

To conclude the findings regarding the case company's sustainability targets, the company has adopted the triple bottom line approach as the definition of sustainability. This is a popular sustainability approach amongst companies, as is evident in the literature. Hence, the SIA tool and criteria for the case company should also evaluate sustainability through the three dimensions of sustainability. This ensures alignment with the sustainability targets of the company. The case company may have the need to emphasize environmental sustainability within the SIA tool as its core business and projects have the most impact

within that area. However, all three dimensions should be represented to operationalize the sustainability targets within the daily activities of employees.

4.2.2. **Industry leadership**

Sustainability efforts cannot be executed in silos but require societal, systemic changes. Systemic change was already determined as a potential driver and obstacle for the push towards sustainability. However, the case company's own role is further explored within this sub-theme.

The case company regards sustainability as one of its core missions and desires to be a forerunner in the industry. This is already evident from the findings in the sub-theme *Systemic change.* Thus, the company pushes for more substantial sustainability commitments from policy-makers and customers.

'We would like more than they [policy-makers] are actually necessarily willing to commit. ... Policy-makers are not making those heavy decisions which would be needed for climate change or other issues ... Company X has had ... positive kind of influencing so it is not that we are trying to be strict "no-no not this kind of legislation", it is more like "please...we need concrete actions."' – Interviewee B

'We are pushing for more than there would be significant customer demand out there, other than from the fact that customers would like to see solutions that for example, consume less fuel and the sustainability comes from that angle. But in general, unfortunately, sustainability is more of us trying to push that angle rather than there being a huge demand from our customers.' – Interviewee E

The comments provide further context for the ambitious sustainability targets of the case company. To be a forerunner in the industry, the company needs to further operationalize sustainability throughout the organization, which the SIA tool can support. However, prioritizing sustainability as a criterion for selecting innovation projects to the accelerator seems dependent on the pace of industry changes and the demand from customers and policy-makers.

4.2.3. **Role of sustainability in decision-making**

Sustainability success is monitored through the opinions and perceptions of key stakeholder groups and investors. The various analyst ratings and investor opinions are tracked regularly to understand how the company and its sustainability efforts are perceived. This way, decisions can be made to satisfy stakeholder groups.

'This ESG [Environmental, Social, Governmental] related investor funds are growing with a huge pace and of course, one of our purposes is to create value for our shareholders, which is one of our stakeholder groups. So, we need to take this into account. If the analysts and rating providers start excluding us from indexes with the top sustainability companies then it is a clear message that we need to do something.' – Interviewee B

'We try to find out what our key stakeholder groups find the most important topics in the area of sustainability.' – Interviewee D

Interviewees also expressed that financial performance is the main driver for decision-making. One interviewee called it a boundary condition that sets the context for company activities, while another indicated that short-term results play a larger role than they should.

'Being a stock-listed company, the primary focus is quarterly results, which is a boundary condition. That is not something we can change. It is a boundary condition that we have to accept and adapt to.' – Interviewee C

'I think we are way too much driven by short term financial results. … I think that we are still growing into our purpose [of enabling a sustainable world]. Even though we have a purpose, which is felt strongly by many people, I think it is not yet driving enough of our decision-making.' – Interviewee A

However, interviewees expressed they feel that the company is acting sustainably within its core business regardless of the emphasis on financial performance.

'Within these boundaries, I would say absolutely yes [the company is acting sustainably]. I feel that there is a strong focus in the company on sustainability. ... We, as a company, can have a significant impact on society as a whole, which is great. I mean, that is one of the things that makes you wake up and go to work happily in the morning.' – Interviewee C

'Yes, I think when it comes to environmental aspects, yes, absolutely [the company is making sustainable decisions]. I do not know how much we are looking at how sustainable our operations are in a certain country. Do we make sure that we do not buy things from a

sub-contractor that is not paying their employees wages? I do not know that part of the business at all. But what I know is that our products and the environmental sustainability aspects there, are very high on the agenda.' – Interviewee F

The role of sustainability in decision-making is multifaceted. On one hand, analyst reviews and ratings play a part in how the case company makes decisions and any possible corrections regarding sustainability. On the other hand, financial performance is the leading driver, and as a stock-listed company, sustainability decisions need to be made within that context. The case company does emphasize sustainability, particularly environmental sustainability, in its core business. Nonetheless, sustainability is not the leading component in decision-making.

It is crucial to understand the context to develop an SIA tool relevant to the case company. The boundary conditions within the case company set the boundary conditions for the tool as well. The role sustainability plays in decision-making on organizational and strategic levels impacts the degree of influence sustainability can have on a project level.

4.2.4. **Employees and sustainability**

Interviewees find sustainability to be a motivating factor in their personal work and that the company mission positively influences their perception of the company and motivates them. Working on sustainability-related projects is important for employees.

'We have a purpose [of enabling a sustainable world], which is felt strongly by many people.' – Interviewee A

*'For me personally, it [sustainability] has always been very important.
I have been working with environmental technologies for many years before this task.
It is something that is very, very close to my heart and to everything I have done throughout the years. So yes, I think it is very important for us to keep high standards in this area.' – Interviewee F*

'It makes you feel sort of important that what you work on can have a positive impact on the world when it comes to sustainability.' – Interviewee C

The employees' desire to work on projects that advance sustainability, can accelerate the acceptance and adoption of an SIA tool that evaluates their projects' sustainability impact.

4.2.5. **Summary of the findings: Case company and sustainability**

The findings within this theme reveal that the company views sustainability through the triple bottom line approach, emphasizing economic and environmental sustainability. Financial performance influences decision-making the most, while environmental sustainability is a focal point in product development. The company's sustainability targets include all three dimensions, and they are communicated to stakeholder groups. The company's overall sustainability emphasis is reflected in sustainability ratings and the desire to be a forerunner in the industry.

Employees perceive the company to care about sustainability issues and find purpose in working on sustainability-advancing projects. While the company mission of enabling a sustainable world inspires employees, the sustainability targets are organization-wide targets instead of concrete targets visible in employees' daily work. Thus, there is still a gap between organizational targets and employees' daily activities. The official sustainability targets are not known to all employees, nor are the targets taken upon by the businesses.

4.3. SIA tool for innovation projects

The final theme relates specifically to the SIA tool designed for this thesis to evaluate innovation projects. First, the existing evaluation criteria for innovation projects are presented, after which suggested elements are discussed. The sub-themes included are *Innovation projects and sustainability, Environmental sustainability, Social sustainability, Economic sustainability,* and *Other factors.*

4.3.1. **Innovation projects and sustainability**

This sub-theme presents information regarding the current criteria of innovation projects: how they are being assessed and whether sustainability is considered. Innovation projects are assessed based on the following criteria:

1. *Is the project aligned with the company and the business strategy?*
2. *How much potential does the idea have?*

3. *How complex is the idea?*
4. *Is there an existing client?*

Sustainability is currently not a criterion nor assessed, even though the company strategy is connected to sustainability. Employees lack knowledge on how to evaluate the sustainability impact of their projects.

'We have a definition for sustainability, but it is not consistently used as an evaluation criterion for projects. ... There is not really [sustainability evaluation knowledge amongst project managers and workers] because the evaluation impact and the evaluation criteria are not consistent.' – Interviewee E

Sustainability is not used as a communication point throughout the projects unless the projects are directly related to sustainability, and it is part of the value proposition. Within projects that are not sustainability-related in an obvious manner, sustainability is not considered.

'Of course, if a project is about sustainability, we are using that as one area in which we do communicate, but it is not a consistent area of communication.' – Interviewee E

'We do [discuss sustainability within the team frequently], also because sustainability is one of the key elements of the value proposition for Customer X.' – Interviewee C

'We have not used the word sustainability, but I must say that within my team, we all share the same vision of helping our colleagues. So, probably indirectly, we have done it. We have not used the word sustainability, as I said. But we are clearly driven by this goal of how can we help all our colleagues in this transition.' – Interviewee A

'No, not at all [discussed sustainability in this project]. And I do not really see the direct connection [of the project] to it [sustainability].' – Interviewee F

Nonetheless, the case company would like to include sustainability as a criterion when evaluating and selecting new innovation projects into the program.

'It is definitely on our agenda, and of course, we should be keeping sustainability as one criterion when we are selecting projects to be executed. ... Naturally, things like financial aspects impact the overall business, but it [sustainability] definitely should be something that we should consistently evaluate when we make the selections.' – Interviewee E

It is important to create an SIA tool useful for the company accelerator. By understanding the starting point and existing criteria used to select new innovation projects, an SIA tool can be created that complements the existing criteria.

4.3.2. **Environmental sustainability**

As mentioned in the findings prior, environmental sustainability is regarded as the case company's core sustainability focus. This sub-theme presents interviewees' opinions on what should be evaluated with the SIA tool.

'Maybe some examples like lower carbon footprint than earlier products or no hazardous waste created anymore with this [project] solution.' – Interviewee D

'NOx and SOx emissions [should be considered].' – Interviewee B

'Does it have a larger impact or is it just something small? … How quick is the impact and also what are the areas that are being affected?' – Interviewee E

The proper evaluation of environmental sustainability is seen as a necessary component of the SIA tool. In addition, the temporal effect and magnitude of the effect on the environment are suggested to be examined.

4.3.3. **Social sustainability**

Social sustainability is not seen as relevant as environmental sustainability for the case company. The evaluation of social sustainability is considered pertinent only when it is relevant to the project. Evaluating social sustainability is more complex than evaluating environmental impact, which can create difficulties for project managers assessing their project's sustainability impact.

'I would not necessarily say that it [including social sustainability criteria] would be critical. But also, a social part that could be that it [project solution] somehow helps some local communities, somehow improving their lives. It depends what kind of project it is.' – Interviewee D

'If the idea [of the SIA tool] is to bring also the social side, like human rights, then it is going to be much more difficult than just the carbon footprint stuff. Because human rights are quite a complicated area with so many aspects, a person who has not been familiarized with the topic at all is going to have a very difficult time to evaluate whether this has a meaning or not.' – Interviewee B

'Does it [the project solution] improve safety which is also obviously sustainable?' – Interviewee B

Developing the criteria for social sustainability seems more challenging than for environmental sustainability. Thus, for non-experts to understand what is meant by social sustainability and how to evaluate it with the SIA tool, the terminology and explanations must be extremely clear.

4.3.4. **Economic sustainability**

Economic sustainability is viewed as unnecessary in an SIA tool since economic factors are already considered in all business decisions.

'I would concentrate on the social and environmental side.' – Interviewee D

'Maybe economic from a sustainability point of view could be more about how it [the project solution] benefits society.' – Interviewee B

The interviewees' answers show that the perception of economic sustainability typically relates to financial sustainability, and thus, they believe it should be excluded from an SIA tool. For economic sustainability to be included in the SIA tool and complement the existing criteria, the meaning of economic sustainability needs to be extended beyond the project solution's profitability.

4.3.5. **Other factors**

Additional elements to consider when designing the SIA tool were suggested, such as dividing the criteria into must-haves and nice-to-haves as well as ensuring that the users have sufficient knowledge to use the tool. Sustainability is a complex issue, and as was discussed in the literature review, measuring and assessing it are not simple.

'We formulated certain criteria that they [suppliers] are now looking at, like do they have ISO14001 environmental management system. Then they basically do the rating, and they have a points level. So, something like that is probably needed here [in the SIA tool] too, to at least get a picture of what is the current level of the project from that [sustainability] perspective.' – Interviewee D

'If there is going to be a group of sustainability experts evaluating it [the project], then we could come up with lots more complicated [criteria], covering all areas of sustainability in this evaluation criteria. But if it is a person that grabs the tool and has no time to familiarize, then the criteria has to be very limited.' – Interviewee B

'There is a significant difference whether you talk about people in Northern Europe where sustainability, in general, is a topic that people have a fairly good understanding of and compare it to, say, Asia, where it is a much newer area in many respects.' – Interviewee E

Based on the interviews, the SIA tool is suggested to evaluate the projects' sustainability level, such as by having a checklist system with points for the criteria the project fulfils. Furthermore, since the SIA tool's intended users vary in location and expertise, the tool has to be simple and explicit enough for everyone to use it.

4.3.6. **Summary of the findings: SIA tool for innovation projects**

The findings within this final theme unveil that sustainability is not a focal communication point or criterion in innovation projects where it is not an obvious value-adding element. However, having sustainability as a criterion and consideration is desired to operationalize sustainability and align the accelerator's activities with the company mission. Environmental sustainability is the most crucial dimension to evaluate as the case company's activities are mainly related to environmental sustainability. Social sustainability is less understood as a topic and more complicated to evaluate. The understanding of economic sustainability is also often limited to financial viability, so clear explanations are needed to support the SIA's criteria and process. The SIA tool's primary target audience is non-experts, which further illustrates the need for simple criteria and detailed explanations.

4.4. First version of the SIA tool

This study aimed to create an SIA tool aligned with the case company's sustainability targets and internal accelerator's process. After gathering primary and secondary data, a prototype of the SIA tool was created. The data collection process included having four employees test the SIA tool by evaluating their project's sustainability impact. Based on the feedback, the designed prototype was refined to improve the user experience and ensure that the tool could provide consistent and valuable insights.

To help understand the later chapters of this study and the feedback of the SIA tool, the prototype is introduced in detail in this chapter.

4.4.1. **Background of the developed SIA tool**

The SIA tool was designed to be user-friendly and straightforward enough for non-sustainability experts to use. The tool is for project managers to evaluate their project's sustainability impact and incorporate sustainability considerations within their project work. Furthermore, the results are for decision-makers to assess projects' potential sustainability impact and make informed decisions based on the results. The SIA tool can be used for any innovation project; it is a high level, quick scan rather than an in-depth analysis. The evaluation should be conducted at the beginning of the project, during which the project solution or concept is not fully refined. This prompts a less accurate sustainability assessment evaluation, so the sustainability impact should be measured continuously throughout the project. Also, other relevant and appropriate tools are recommended in order to produce more accurate data and evaluations. Moreover, the produced total scores should not be viewed as absolute scores. They are meant to merely offer general direction and place the project in a sustainability impact matrix.

The first version of the SIA tool is an Excel tool utilizing macros. There are nine pages, including a navigator page that acts as a table of contents. Each page has a navigator button on the top right corner for easy access to the navigator page. Also, the upper corner has a progress bar showing how much of the analysis has been completed in percentages. The different pages of the SIA tool are presented below.

4.4.2. **Introduction -page**

The Introduction -page provides instructions for completing the SIA. It presents the purpose of the tool and key user instructions.

4.4.3. **Economic sustainability -page**

The SIA begins with the assessment of economic sustainability. The criteria were aligned with the case company official sustainability targets and further negotiated with the sustainability managers to include the most relevant ones. To examine the project's sustainability impact, users have to answer the question: *How will the project solution affect the following five factors?* The options are: *significantly worsens (-2 points), worsens (-1 point), makes no difference (0 points), improves (1 point)*, and *significantly improves (2 points)*. The user then goes through each criterion and gives a score based on how their solution affects the factor.

In this assessment, the economic sustainability factors relate to the organizational focus on the economic value created from branding and leadership positioning around sustainability rather than created shareholder value. The rest of the factors relate to economic value creation and growth within the local society. Table 10 presents the criteria and explanations for economic sustainability.

Table 10: Economic sustainability criteria and explanations

Criteria	**Explanation/Example**
Organization's leadership position in sustainability	Being a forerunner in sustainability, having a high ranking in sustainability ratings, being included in impact investing funds
Organization's brand image	Public's perception of the organization's sustainability
Economic well-being of local society	e.g., jobs creation and income generation especially in communities where there is slowed down economic growth/activity
Societal infrastructure	e.g., providing electricity in a location with previously unreliable production
Knowledge infrastructure	Enabling creation and distribution of knowledge, data and understanding in the context of open innovation

After the user answers the question for each criterion, the progress bar on the upper corner shows that 25% of the SIA is complete. The SIA tool shows a total score which is negative or positive depending on the sustainability impact. The total score includes a weighting that is dependent on the priority analysis results. The priority analysis and weighting will be covered in a later section of this chapter.

4.4.4. **Social sustainability -page**

The SIA continues in a similar manner as in the previous page. Again, users have to answer the question: *How will the project solution affect the following five factors?* The options are: *significantly worsens (-2 points), worsens (-1 point), makes no difference (0 points), improves (1 point)*, and *significantly improves (2 points)*.

The social sustainability factors focus on safety on a systems level as well as product level as they are integral to the case company's social sustainability strategies and targets. Table 11 presents the criteria and explanations for social sustainability.

Table 11: Social sustainability criteria and explanations

Criteria	**Explanation/Example**
Safety of industry	Systemic level change of the industry/ecosystem and/or change of common standards within the industry
Safety of products/services/ solutions	Safety and security (e.g., physical safety and cyber security of operating products or change in part of the system)
Responsible business practices (in relation to externals)	Includes anticorruption practices, code of conduct implementation, responsible extraction of raw materials, supply chain management, anti-discrimination
Employee well-being; development, occupational health or safety	Satisfaction and enjoyment in the workplace, fair and equal treatment, safe working environment, trainings, possibility of development, zero accidents
Health and well-being of local communities	Local community's well-being and health, e.g., through stakeholder collaboration with local government or reduced pollution

After the user answers the question for each criterion, the progress bar on the upper corner shows that 50% of the SIA is complete. The total score of the dimension is also visible, and the user then continues to the next sustainability dimension.

4.4.5. **Environmental sustainability -page**

The last dimension follows a similar pattern as the previous dimensions. The user answers the question: *How will the project solution affect the following five factors?* The options are: *significantly worsens (-2 points), worsens (-1 point), makes no difference (0 points), improves (1 point)*, and *significantly improves (2 points)*.

The environmental sustainability factors are all integral to the case company's sustainability targets and relevant to the products and solutions offered by the case company. Table 12 presents the criteria and explanations for environmental sustainability.

Table 12: Environmental sustainability criteria and explanations

Criteria	**Explanation/Example**
Emissions (to water or air)	Includes pollution, non-greenhouse gases (GHG) and GHG, e.g., CO_2, NO_x, SO_x.
Use of renewable energy sources	e.g., solar, wind power or geothermal power
Efficiency	e.g., less consumption of fresh water, energy or other resources
Biodiversity	e.g., sustainable land use, preservation of species and aquatic ecosystems. Be especially aware if you operate close to a nature preservation area on land or water!
Circular economy thinking	Includes recycling, upcycling, remanufacturing, refurbishing, reselling, replenishing, sharing, repairing, restoring, repurposing, reusing, recovering

There is a note in the tool explaining that if the project solution reduces emissions (the first criterion), the input score will be negative. However, the tool will then change the score to be positive for the sake of consistency. The total scores can then be interpreted so that a net negative score indicates a negative impact, while a net positive score indicates a positive impact.

Having answered the question for each criterion, the progress bar on the upper corner shows that 75% of the SIA is complete. The total score of the dimension is visible, and the user can then continue to the additional factors.

4.4.6. **Additional factors -page**

The questions in this page ask for further information to provide a holistic picture of the project solution's SIA impact. The first two questions are: *Will the project solution take a lifecycle perspective approach? Will the project solution be compliant with forthcoming environmental regulations?* The answer options are: *No, Not relevant,* and *Yes.* The answers' scores are added to the total sustainability impact.

The tool then focuses on the magnitude of impact by asking the user to evaluate the project solution's impact by looking at time and market factors. Figure 13 is a screenshot of the tool showcasing the questions and answer options for the factors.

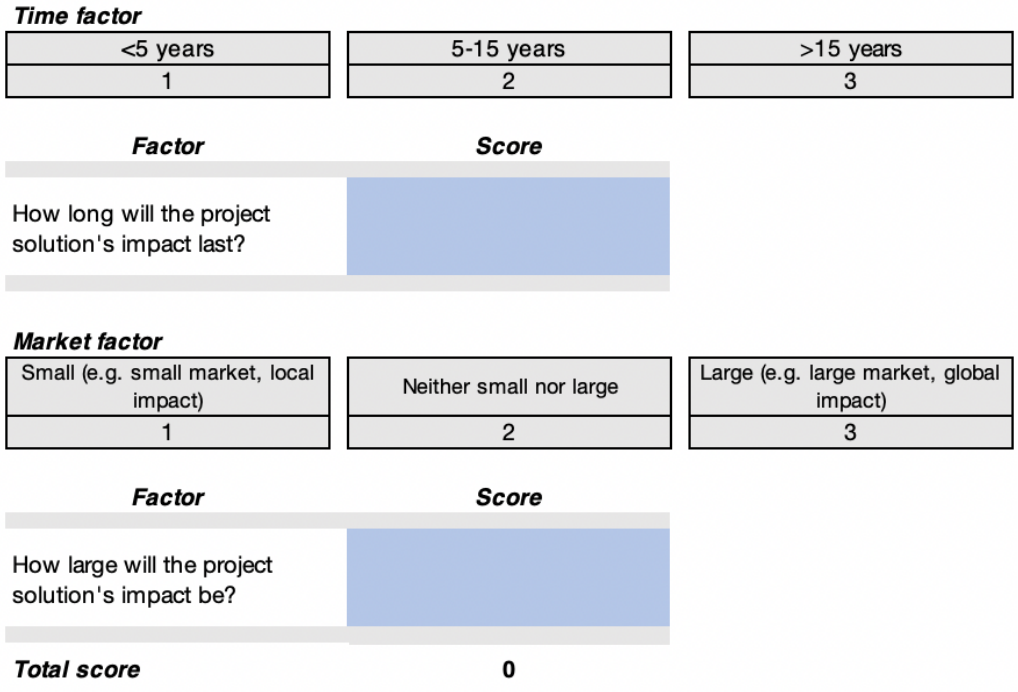

Figure 13: Questions and answer options regarding magnitude of impact

The user inputs the answers in the blue cells and the tool then offers a total score. Also, the progress bar on the upper corner shows that 100% of the SIA is complete. The user can continue to the results.

The questions may be challenging to answer but they are important to the case company and relevant to their sustainability targets. The answers can thus support decision-makers make informed decisions and users reflect upon their project's potential sustainability impact.

4.4.7. **Results -page**

This page showcases the results in three different manners. First, the negative or positive sustainability impact of each dimension is shown in a bar graph; examples of the graph will be presented later in Figures 14–16. Second, the total sustainability impact and magnitude of impact are visualized in a sustainability impact matrix; examples of the matrix are presented later in Figures 17–19. Third, the total value scores are also shown in a table, and the user can then download a pdf version of the page and capture the current results by using one of the embedded macros. Consequently, the results can be presented in an easy format for decision-makers. The bottom of the page encourages users to delve into further sustainability tools for more support and sustainability consideration.

4.4.8. **Further sustainability tools -page**

This page introduces different sustainability tools, frameworks and supporting material for users to further consider sustainability in their projects. For example, the user can find a triple layered business model canvas template adopted from Joyce and Pacquin (2016) and guidebooks and softwares for lifecycle assessment.

4.4.9. **Appendix -page**

The appendix shows the revisions made to the tool and supplementary explanations for some of the criteria. For example, the appendix includes a more detailed explanation for the social sustainability criterion, *Health and well-being of local communities*: 'A project related to this factor can e.g. include a partnership with the local government to improve the well-being

of local community members or support local community activities. Reduced pollution is an environmental issue, but it is also added here, as pollution is a social issue as well and directly relates to people's health'.

4.4.10. **Priority analysis -page**

The final page in the SIA tool contains the priority analysis. Sustainability managers conduct the priority analysis before employees complete the SIA of their project. The analysis provides a method for prioritizing a particular criterion or dimension over another. It aims to align the criteria with the case company's overall sustainability targets and priorities. For instance, the case company considers environmental sustainability the most value-adding and relevant dimension when assessing innovation projects' impact. Thus, the priority analysis offers a means to give environmental sustainability a greater weighting and a higher total score.

Now that the first version of the SIA tool is presented, the feedback regarding the prototype will be covered in the following chapters.

4.5. Feedback regarding the SIA tool prototype

The SIA tool and sustainability criteria to evaluate the case company's innovation projects were created using the primary and secondary data. The tool was then tested by having three different users from one of the three case projects (Project A) evaluate their project's sustainability impact. A fourth user from an unrelated innovation project (Project D) also tested the tool and evaluated their project.

4.5.1. **Results from Project A's SIA**

The product owner (who was also one of the interviewees), the project manager and project member from Project A conducted an SIA of their project using the created SIA tool. The results from the three different project members show that the results are still somewhat impacted by the subjective understandings of sustainability and its relation to the project. Each user's results can be seen below in Figures 14–16.

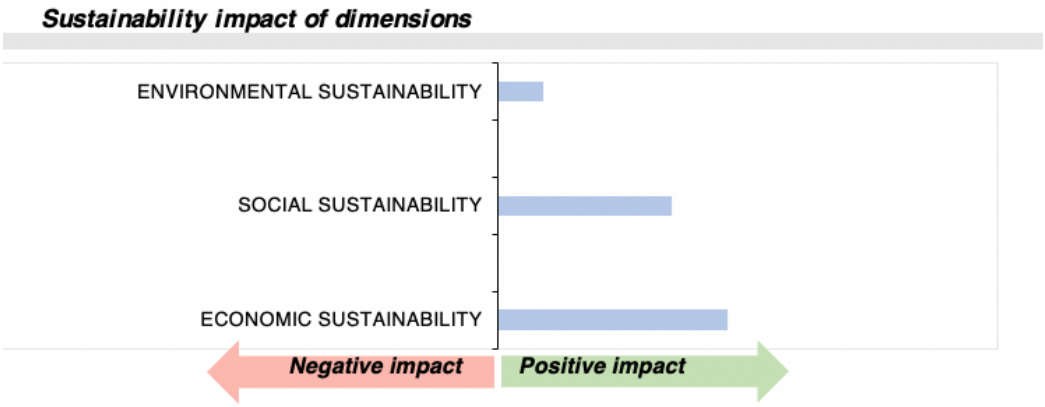

Figure 14: Project A's SIA results – product owner

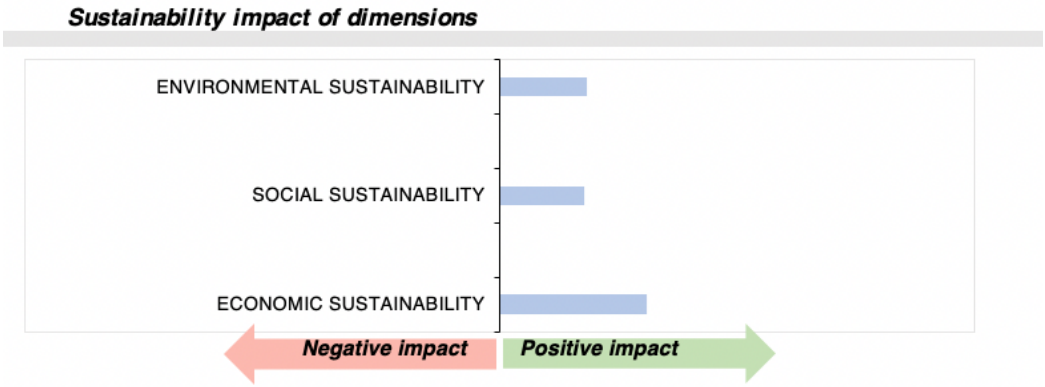

Figure 15: Project A's SIA results – project manager

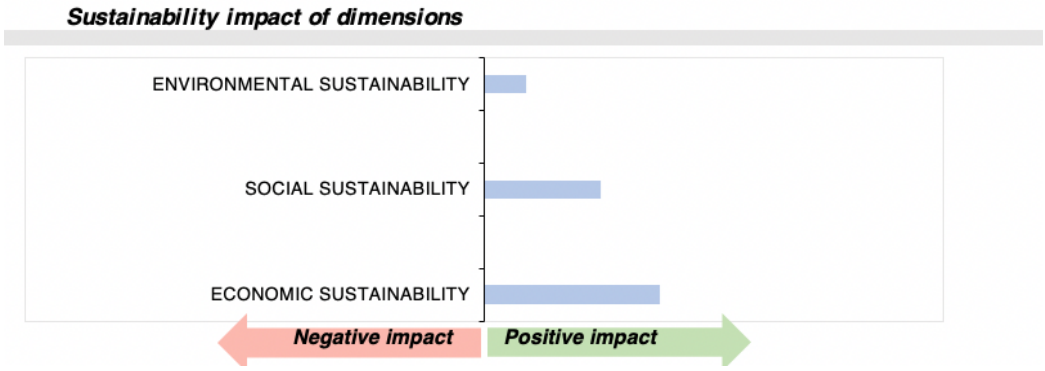

Figure 16: Project A's SIA results – project member

The project members all perceive their innovation project to have a positive impact on the three sustainability dimensions. As the SIA tool is intended to be an initial checklist for assessing the potential sustainability impact, it is not as essential to have the results match one another. However, the general direction should be the same. In this case, it can be concluded that the results are all in the same range, and at a minimum, in agreement that the project contributes to sustainability in all dimensions.

The SIA tool also asks the user to evaluate the magnitude of impact from a temporal and market perspective. The project members' results are presented in Figures 17–19. The results are interpreted so that the placement of the blue dot on the y-axel shows the total sustainability impact of the project, ranging from very negative impact to very positive impact. The blue dot on the x-axel shows the magnitude of impact the project has. The project can have a small-scale impact, a large-scale impact or neither small nor large impact.

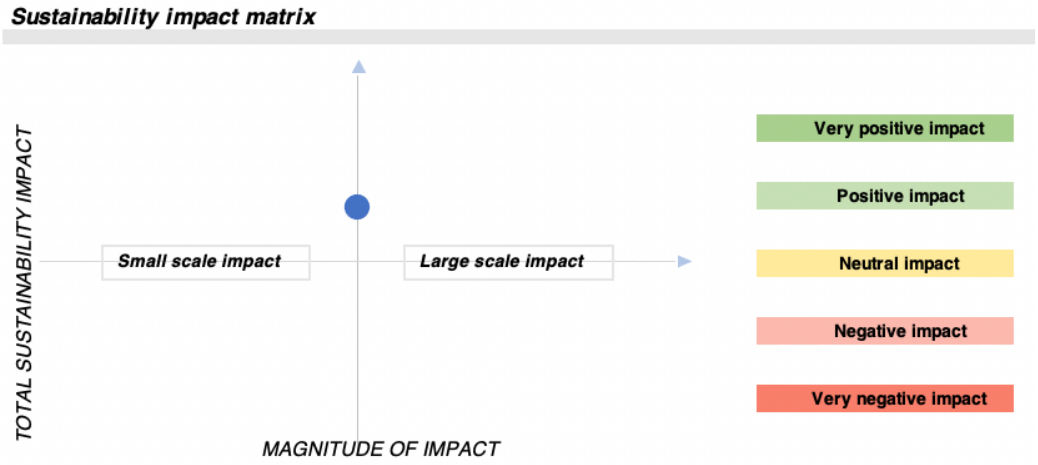

Figure 17: Project A's sustainability impact matrix – product owner

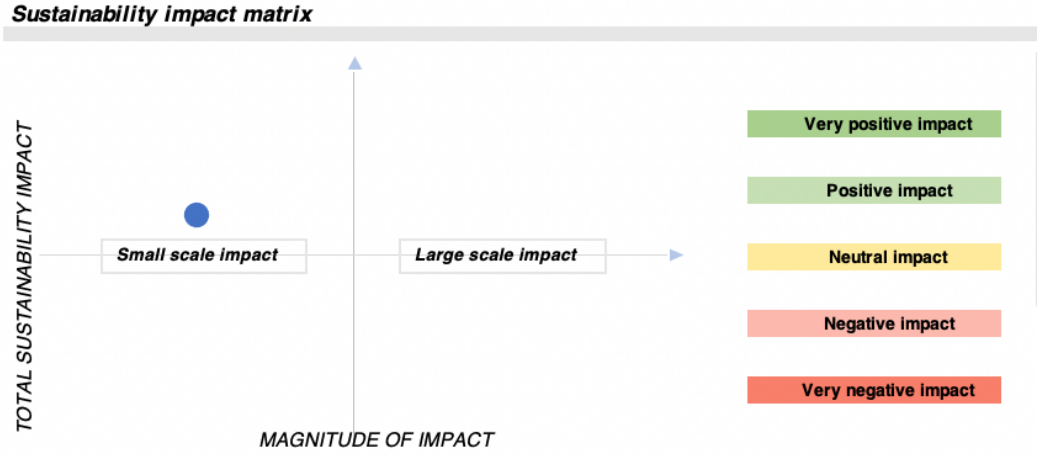

Figure 18: Project A's sustainability impact matrix – project manager

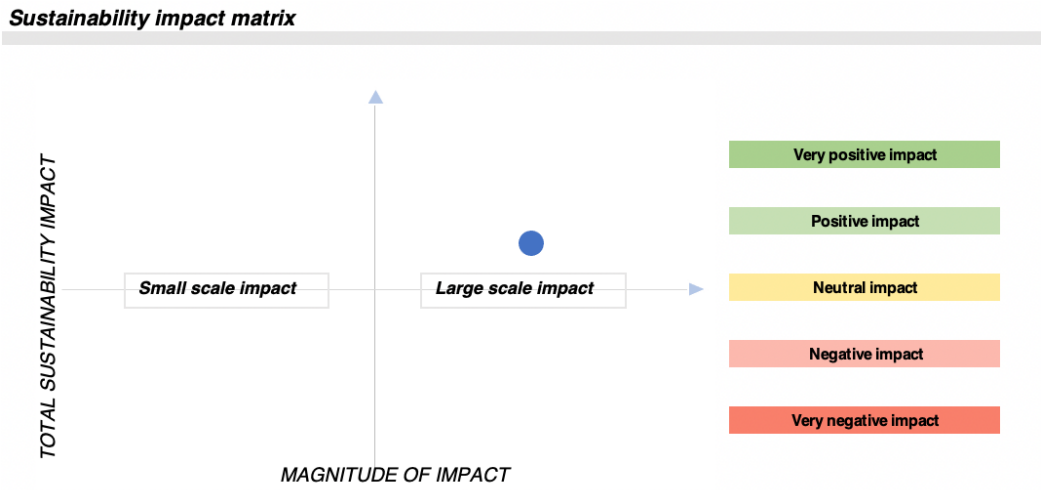

Figure 19: Project A's sustainability impact matrix – project member

The results regarding the project's magnitude of impact vary amongst members. The total sustainability impact is between neutral and positive in all assessments. The magnitude of impact shows the biggest variation since each project member perceives it differently.

The overall results from the three SIA's of the same project show that sustainability is not a clear-cut issue, and sustainability perceptions of the same project vary. However, on a high level, the results can be considered to communicate that the project members believe that the project will have a positive sustainability impact. The accuracy of results could be increased by having the team members work on the SIA together and discuss the various potential sustainability impacts the project may have.

4.5.2. **Results from Project D's SIA**

The SIA tool was also tested by a product owner of an innovation project (Project D). The product owner was given the same version of the SIA tool as the users from Project A. The product owner did not have prior knowledge about the SIA tool or its purpose. The aim was to observe how the tool is used and whether the criteria and evaluation process are clear for the product owner. Quotes from the session and observations are shared in this section.

The instructions and questions themselves were clear to the product owner. This was evident from the product owner's comments regarding the criteria and explanations for choosing a

certain score. Nevertheless, having support from myself during the call was helpful. Thus, a need for an instructional video for first-time users explaining how to use the SIA tool was identified.

'Social sustainability analysis and safety of industry. I would not say that this [the project] will change that.' – Product owner of Project D

Although the instructions were clear to the product owner, they added the initial scores to incorrect cells. These mistakes can be avoided by making changes to the tool so that users cannot edit other cells besides the correct ones. Once the product owner had gone through the first dimension's criteria, they could continue the analysis with ease.

When the product owner saw the results visualized, they analyzed the given results and instantly understood and agreed with them. Figure 20 shows a screenshot taken from the Skype call, during which the product owner conducted the SIA on their project.

Figure 20: Screenshot from Skype conversation – Project D

Finally, the product owner offered ideas to improve some of the wording and include supporting material on further resources, such as the UN SDGs. The comments were taken into account for refining the SIA tool, and revisions to the tool will be presented in the discussion chapter of the thesis.

5. DISCUSSION

The main themes of this study are explored by reflecting the findings against the extant literature. First, the implementation of sustainability into decision-making is deliberated. It is followed by an analysis of how an SIA tool can operationalize sustainability. Subsequently, the SIA tool's criteria are discussed, and finally, the developed SIA tool is presented.

5.1. Sustainability can be implemented into decision-making with sustainability assessment measures

Sustainability needs to be implemented into decision-making in order for it to be operationalized (Khalili, 2011; Waas et al., 2014). There are many methods for doing so. A critical element is viewing sustainability as a decision-making strategy instead of simply an add-on to operations (Waas et al., 2014).

The findings of this study demonstrate that sustainability is not usually a fundamental criterion affecting decision-making in companies. Thus, sustainability must align with the company's broader strategy to be operationalized and implemented into decision-making (Waas et al., 2014). In a company context, the strategy, vision, drivers and sustainability targets set the foundation for sustainability operationalization (Khalili, 2011). Although arguably, sustainability should be a high priority for companies, financial performance is often the leading driver of public corporations' activities (Borland, 2009; Brønn & Brønn, 2018; Elkington, 2018). This study's findings support this notion; one interviewee contended that the case company's decision-making is influenced too much by short-term financial performance. Another interviewee described financial sustainability as a boundary condition that the projects must adhere to. Financial performance can be both a driver and an obstacle for sustainable development. It is an interesting paradox; a company can simultaneously be seen as a forerunner and a part of the problem. I offer two explanations for this.

First, similarly to the case company, companies may operate in traditionally unsustainable industries and have an overall negative net sustainability impact due to the product and industry's nature. Even if a company deploys more sustainable solutions than other industry

companies, the net impact can still be overwhelmingly negative from an absolute value perspective. The slow pace of sustainability transitions on an industry- and policy-level can continuously decelerate sustainable development on a company level. If the company's customers and the industry are not ready for more rapid change, sustainable solutions may not have the needed demand.

On the other hand, industry conditions can offer companies the opportunity to set themselves apart and become forerunners in sustainability. Companies that consider sustainability in their products and services can turn sustainability into a business case and a value-adding differentiator against their competitors. Sustainability can thus be a strategic component and integrated into the core operations. Embedding sustainability into strategies and focusing on the business case is also supported by the findings of this study. The interviewees agree that having a business case helps accelerate sustainable development.

The interviewees expressed the belief that the case company acts sustainably within the boundary condition of financial stability. However, simultaneously, many employees are not fully aware of the company's official sustainability targets. Moreover, the sustainability targets are organization-wide targets, meaning that the company's businesses have not taken ownership of them. Although the interviewees believe that the company takes sustainable actions, the projects' or activities' sustainability impacts are not examined unless sustainability is crucial to the project. Arguably, this is paradoxical and further illustrates the gap between organizational targets and employees' daily activities. How can employees know that the company is acting sustainably if they are not even sure that their projects' activities are, in fact, sustainable? Or how can employees know that the company is improving its sustainability impact if they are not aware of the sustainability targets that the company is striving for?

Different people view sustainability in different ways, which can partially explain the contradiction. As the literature describes, sustainability, as a concept, is multifaceted, and definitions vary based on, for instance, values, culture and perceptions (Pope et al., 2004; Johnston et al., 2007; Butler et al., 2011; Hugé et al., 2013; White, 2013; Pope et al., 2017; Zimek & Baumgartner, 2020). Thus, determining what is objectively sustainable is not a

clear-cut task. Implementing sustainability into decision-making is, therefore, also a complex matter.

The literature attests that sustainability assessment serves as a means for implementing sustainability into decision-making (Devuyst et al., 2001; OECD, 2010; Waas et al., 2014; Pope et al., 2017). Clear sustainability definitions and indicators support sustainability operationalization and make it more tangible (Waas et al., 2014). However, it is necessary to recognize that sustainability operationalization requires systems thinking and various supportive measures and tools (NRC, 2011; Dahl, 2012). Creating and using an SIA tool is only one step and approach in the path towards sustainable development. It can bring sustainability targets closer to employees and help them reflect upon their activities' impacts against the company's sustainability targets.

An SIA tool can also support decision-makers make more informed decisions (Waas et al., 2014). However, the right balance between simplicity and accuracy is challenging to achieve (Waas et al., 2014). For an SIA tool to be adopted by employees and decision-makers, simplicity is needed (Delai & Takahashi, 2011). The SIA tool's feedback also highlighted this point; when users were faced with criteria they were unfamiliar with or misunderstood, they either interpreted the criteria how they saw fit or left the questions unanswered. This relates to another key element that needs to be considered when planning the SIA tool's content. As Waas et al. (2014) argue, there should be more emphasis on judging sustainability indicators based on their impact on decision-making rather than their accuracy to measure sustainability. In other words, it is more important that the SIA tool is understood similarly across the projects to evaluate its influence on the company's decision-making rather than to make sure the tool is reflecting the entirety of the sustainability terminology perfectly.

The level of comprehension of the SIA tool's criteria also relates to the user-friendliness of the tool. Corroborating Delai and Takahashi's (2011) findings, users did not take the time to research the SIA tool's topics or delve deeper into them. Instead, users craved simplicity and wanted a quick checklist to fill out in the moment. Decision-makers also wanted a simplistic view of the results; consequently, the results were presented in a matrix and graphs that were easy to download as a pdf file.

An SIA tool that fits the context and evaluates sustainability impact by aligning with the organizational processes can offer decision-makers insights to consider (Butler et al., 2011). It is imperative to look at the context and measures which support sustainability operationalization best. In the case company, their internal accelerator already has pre-existing criteria to evaluate the projects' value. Thus, adding an SIA tool to the process that complements the existing criteria and gives further insights for the decision-makers is sensible. In this case, the case company's accelerator has a straightforward process and thus, implementing an SIA tool is appropriate. However, it is not the only approach, and other holistic and supporting actions are needed together alongside it (NRC, 2011).

5.2. Sustainability impact assessment is a means to operationalize sustainability

The findings and literature affirm the need for sustainability operationalization (Khalili & Melaragno, 2011; Lange et al., 2012; Waas et al., 2014; Caiado et al., 2018). For corporations, this often means narrowing the gap between organizational targets and employees' daily activities. As discussed, SIA is a means to operationalize sustainability and implement it into decision-making. Sustainability assessment guides decision-makers to plan short to long-term actions towards sustainable development (Devuyst et al., 2001; OECD, 2010). Also, it assists in interpreting sustainability and structuring information (Waas et al., 2014). Thus, by evaluating the sustainability impact of innovation projects, employees can better understand their activities' effects and see how they advance or hinder the broader organizational sustainability targets.

The case company desires to include sustainability considerations and assess the accelerator's projects' sustainability impact. The findings reveal that sustainability was not considered consistently throughout the accelerator's projects prior to this thesis. As the projects in question are digital, innovative projects, an SIA tool is deemed an appropriate instrument. The TCOS framework highlights the importance of gaining socio-political legitimacy in new technology diffusion (Hall et al., 2019). Given that an SIA tool can support this, it further justifies creating an SIA tool out of all the various sustainability operationalization measures. The examined sustainability assessment frameworks in the literature review provided guidelines, principles and a benchmark for designing an SIA tool.

The empirical findings provided the background to understand the case company and modify the tool to fit the context. The combination of empirical findings and literature made it possible to create an SIA tool backed up by literature and suitable for the case.

As a first step, the NRC's (2011) EPA sustainability framework and Delai and Takahashi's (2011) research stress the need to embed an SIA tool into the organization's overall sustainability paradigm. An SIA is not to be conducted in a silo. Instead, it is integral to align the assessment with the accepted sustainability definition, principles, vision and targets (Delai & Takahashi, 2011; NRC, 2011). The balanced scorecard approach follows this notion and offers different alternatives to include a sustainability perspective that best suits the organization's needs (Dias-Sardinha et al., 2002; Butler et al., 2011). Thus, it is crucial to understand the context to develop an SIA tool relevant to the case company. The boundary conditions within the case company set the boundary conditions for the tool as well. Moreover, the role sustainability plays in decision-making on organizational and strategic levels impacts the degree of influence sustainability can have on a project level. In this case, sustainability is a desired evaluation criterion for the accelerator, but it is not the sole factor determining which projects will advance and be developed.

While the literature supports the sentiment that SIA should be adjusted to the organizational context and adhere to the sustainability paradigm (Delai & Takahashi, 2011; NRC, 2011), Hugé et al. (2013) raise the issue that assessments and solutions can be thus swayed by the organizational, political and subjective circumstances. This then begs the question whether the chosen measurement systems and indicators are the most relevant ones from an objective viewpoint. It is essential to acknowledge that an SIA tool's adoption does not mean by default that sustainability is accurately measured and analyzed. However, this discussion is out of this study's scope. It does nonetheless further illustrate the importance of creating an SIA tool that is also consistent with extant research.

Delai and Takahashi's (2011) sustainability measurement system steps and the Bellagio STAMP (Sustainability Assessment and Measurement Principles) (Pintér et al., 2012) provided a much-needed foundation for creating the SIA for this study. They outlined the sustainability assessment process requirements, and the empirical findings then provided the needed information. For instance, the seventh Bellagio STAMP is "broad participation"

(Pintér et al., 2012). The principle strives to ensure that stakeholders and end-users are included in the process to communicate their views and that the assessment is suitable for the users (Pintér et al., 2012). In this study, the principle was considered by ensuring that the sustainability managers were involved in the research process to express the stakeholder groups' main sustainability priorities. Furthermore, interviews with the accelerator's general manager were conducted to guarantee the SIA tool's alignment with the existing process. Finally, end-users were asked to test the tool to gather feedback and refine it. Considering the Bellagio STAMP (Pintér et al., 2012) and Delai and Takahashi's (2011) steps helped mitigate some of the challenges with SIAs. They provided a straightforward process and scope, grounding the SIA tool in literature.

Nevertheless, designing an SIA that is both vigorous and appropriate is difficult (Sala et al., 2015). Impact assessments attempt to capture the consequences of actions taken today (IAIA, n.d.). However, the full extent of the impacts and externalities are difficult to predict at such early stages, especially with new technology diffusion. Sustainability impacts cannot be accurately analyzed and assessed until some time passes (Costanza & Patten, 1995). Moreover, as discussed, conducting sustainability assessments is no assurance that the examined projects are or turn out to be sustainable (Sala et al., 2015).

Thus, additional means of operationalizing sustainability are needed. As this study focuses on SIA, the other measures were not covered in this thesis. However, some activities, such as analyst ratings and lobbying efforts, were raised by interviewees, thereby highlighting that a variety of measures are imperative for large-scale societal change. Overall, systemic change requires holistic solutions.

5.3. The SIA criteria should include all three sustainability dimensions

This thesis and the created SIA tool view sustainability through the three pillars of sustainability, as the case company's official sustainability targets adhere to this definition. The NRC (2011) also recommends adopting the three pillars definition as it is a universally accepted sustainability description. Furthermore, Delai and Takahashi (2011) analyzed eight well-known sustainability measurement initiatives, most of which adopted the three pillars

of sustainability or a similar version as the official starting point for sustainability assessment.

The SIA tool's criteria and process were formulated in dialogue with sustainability managers (sustainability experts) and project managers (sustainability non-experts) to ensure the accuracy of criteria, stakeholder collaboration, and relevance to decision-making. The literature attests to the importance of utilizing stakeholder participation and expert insight throughout the process (NRC, 2011; Pintér et al., 2012; Waas et al., 2014). Combining different perspectives assures that diverse expertise and strengths are considered (Waas et al., 2014).

It was necessary to include all three sustainability dimensions in the SIA tool and criteria. Although some of the findings suggested that measuring social sustainability may be too complex and measuring economic sustainability may be irrelevant for the tool, I argue that all dimensions are needed. First, the SIA tool's foundation and context are the case company's sustainability targets and vision. The company has formally adopted the three pillars of sustainability as its sustainability definition and has targets in all dimensions. Hence, the SIA tool should reflect the sustainability targets and act as a mechanism to operationalize them further.

Moreover, the findings demonstrated that economic sustainability is at times equated to financial performance. However, economic sustainability is a broader concept. Besides creating value for shareholders, it can also mean creating societal value. Therefore, the SIA tool's economic sustainability criteria also include factors that create value for stakeholders, not just shareholders. Nonetheless, creating societal value can also create shareholder value and be critical in advancing the case company's sustainability targets and competitive advantage.

The findings showed that both experts and non-experts found it challenging to assess or know what to assess for social sustainability. Environmental sustainability seemed the most clear-cut. This may be partially due to environmental sustainability being the most relevant dimension for the case company's operations, products and sustainability impact. Nonetheless, this phenomenon is visible across initiatives and organizations; many focus on

assessing primarily environmental impact (Warhurst, 2002; Adams & Frost, 2008; Delai & Takashashi, 2011). This can be partially explained by environmental measurement tools being more mature than holistic sustainability measurement systems (Delai & Takahashi, 2011). However, companies also find it challenging to define social and economic sustainability indicators (Adams & Frost, 2008).

Hence, the desire to exclude economic and social sustainability criteria may arise from a lack of knowledge rather than a lack of importance. For instance, one of the company's main sustainability targets and overall focus is improving the safety of products, solutions and employees' working environments. The interviewees may not have associated safety with social sustainability. Nevertheless, safety elements were essential to include in the criteria.

The SIA process itself can be a learning experience for employees that are non-sustainability experts (Waas et al., 2014). Conducting an assessment can encourage them to consider sustainability more in their daily work. The feedback received from SIA tool users in the data collection phase of this study also supports this. When employees used the SIA tool prototype and evaluated their projects, they exhibited intentional deliberation surrounding sustainability, what it means, and its relation to the projects. The users gained new insights regarding how the project solution is related to sustainability in ways that were not initially obvious. For example, as one of Project A's team members evaluated the project's sustainability impact, they realized new use cases to increase employees' knowledge regarding sustainability issues through their digital learning solution.

Ultimately, the literature and findings were utilized to create the SIA tool and include all sustainability dimensions. As the criteria were introduced in the Empirical findings -chapter, they will not be presented here again.

5.4. Developed SIA tool

As the SIA tool's end-users are employees and decision-makers that are non-experts in sustainability, it was essential to develop a user-friendly tool with clear definitions and explanations. Diverse digital projects will be examined with the tool. Hence, it had to be developed to contain a process and criteria applicable for various projects and accurate

enough to assess the sustainability impact properly. Pope et al. (2017: 212) suggest having a guiding question throughout the SIA, such as 'Does this proposal make a positive contribution to sustainability?'. The NRC (2011) also recommends evaluating potential actions by reflecting whether they will improve or worsen human and environmental well-being in the present and the future. These approaches were adopted in the SIA tool, and the main question became: "How will the project solution impact the following sustainability factors?". The answer options ranged from "significantly worsens" to "significantly improves". The users felt that the question was simple and straightforward enough, and they could thus complete the sustainability assessment.

The SIA tool is intended to be a quick checklist instead of an extensive evaluation. The EPA's sustainability framework also includes an initial screening -phase (NRC, 2011). The NRC (2011) suggests creating routine sustainability assessment procedures for projects with a small sustainability impact and more extensive processes for others. Hence, if the project has possibly far-reaching effects, it should be further examined (NRC, 2011). This approach could be useful for the accelerator to adopt as well if the projects seem to have widespread effects.

Therefore, routine and comprehensive evaluation processes could be explored to support projects with varied potential sustainability impact. The NRC (2011) also recommends having a "sustainability toolbox" with additional analytical and impact assessment tools to use. The created SIA tool for the case company also includes an additional page with further resources. Feedback from users validated the need as they requested additional resources on sustainability operationalization and assessment.

The feedback gathered in the data collection phase did not result in significant modifications to the SIA tool. The refinement included small changes, such as fixing formatting issues, adding further resources and filming an instructional video. Also, some further instructions and suggestions were added. Although the current SIA tool is this study's final version, it is still an early version. It should be refined and assessed continuously to ensure that it captures relevant insights regarding sustainability impact.

6. CONCLUSION

This chapter summarizes and concludes this study. First, the research summary will be presented. The summary contains short descriptions of the research topic, process and findings. Subsequently, implications will be explored on a managerial level and broader context. Finally, the limitations of the study and suggestions for further research will be laid out.

6.1. Research summary

A growing number of businesses are experiencing digital transformations and incorporating sustainability into their core values. Digitalization and sustainability have gained prominence as influential megatrends, resulting in extensive research on the topics separately. However, there is still a scarcity of research that combines sustainability and digitalization (Kiron & Unruh, 2018).

Therefore, this case study contributes to the existing literature by providing insight into sustainability operationalization within a case company's internal accelerator. The aim was to create an SIA tool for project managers and project workers to assess the sustainability impact of their digital innovation projects. Furthermore, the intention was to support decision-makers consider sustainability impact when examining the innovation projects' value. Hence, the research questions were:

1. How can sustainability be implemented into the decision-making process?
2. How can the sustainability impact of innovation projects be assessed?
3. What are the most important criteria to take into consideration regarding the sustainability impact of innovation projects?

The research findings arose from literature, interviews, digital material and testing of the created SIA tool. To conclude, sustainability assessment is a means to operationalize sustainability and implement it into decision-making. A user-friendly and simple SIA tool can support project managers and workers evaluate and reflect upon their projects' sustainability impact. Furthermore, an SIA can also educate employees and decision-makers

on sustainability when conducting the SIA and considering the results, respectively. The SIA criteria need to be aligned with the organizational sustainability targets to operationalize sustainability within the company context and strategies. It brings sustainability targets closer to employees and diminishes the gap between organizational targets and employees' daily activities.

Furthermore, it is essential to understand that SIA is only one tool in operationalizing sustainability. Embedding sustainability into operations requires further supportive measures. Moreover, the findings highlight that although companies consider sustainability to be important, financial performance is still a leading driver in decision-making.

Many of the findings were supported by the literature on the topic. However, as the chosen research tradition was a case study research, some of the findings were exclusive to the case company. For instance, the designed criteria were created to fit the case company context and their sustainability targets.

6.2. Managerial implications

This study's research and findings have practical implications for the case company. In addition, they can support other companies undergoing digital transformations and aiming to assess their project's and activities' sustainability impact.

The outcome of this study was an SIA tool for the case company's accelerator. The SIA tool was proven to be usable and valuable to employees testing it. Consequently, the case company is now equipped with a tool to operationalize sustainability further. They can consider sustainability when assessing innovation projects' value, make more informed decisions and encourage employees to consider sustainability in their activities. By having a simple checklist, an SIA can be easily conducted because no sustainability expertise is needed. The SIA tool is meant to be the first step in the journey of sustainability operationalization within the accelerator, supported by other measures.

Since the process and criteria are explicitly explained in this paper, other companies and organizations can adopt the created SIA tool and modify it to suit their sustainability targets

and context. Moreover, the findings can provide companies insight into sustainability drivers and obstacles and perceptions around sustainability. Sustainability is a multifaceted and complex issue. Many may believe it to be too complex to assess on a project level. Therefore, this study and the SIA tool can provide an example for other companies exploring sustainability assessment. They can start with a short, checklist type version as the case company and then refine the process to be more holistic and extensive.

6.3. Limitations of the study and suggestions for further research

There are several limitations worth mentioning and suggestions for further research. First, the research included only one case company. Also, sustainability targets and strategies are unique to each company. Thus, the findings are somewhat distinctive to the case company and cannot be directly applied to other companies. Further validation and similar research of companies in other countries and industries would be required to understand better whether the findings are generalizable.

Moreover, as this is a Master's thesis, the limited resources and time guided the research. This study aimed to create an SIA tool and explore the implementation of sustainability into decision-making. Although the objectives were met, a longitudinal study could have offered deeper insight into how the SIA tool was being used and its actual effect on decision-making.

Given the above, a suggestion for further research is conducting a longitudinal study on the topic since it could validate the hypothesis that an SIA tool increases sustainability consideration and brings sustainability targets closer to employees' daily work. Namely, a longitudinal study could examine whether the SIA tool results are, in fact, accurate estimates of future sustainability effects considering sustainability cannot be reliably evaluated until after some time has passed.

Finally, sustainability and digitalization are rapidly evolving megatrends. For this reason, the topics need to be continuously researched to ensure new and current insights. Nonetheless, the findings of this study contribute to the discourse on sustainability operationalization and act as a starting point for the case company's sustainability impact assessment on a project level.

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APPENDICES

Table I Stages to develop sustainability measurement systems

Step	*Category*	*Objective*	*Expected characteristic*	*References*
I – Starting point	Sustainability vision and concept	Define sustainability vision and concept Define sustainability goals	Guided by a clear sustainability vision and concept Vision operationalised by sustainability goals	Hardi and Zdan (1997); Bossel (1999); OECD (2005); Hardi (1997); Martin and Odell (1996); Veleva and Ellenbecker (2001); Labuschagne *et al.* (2005); Figueiredo (2003)
II – Content	Structure	Establish system abstraction levels	Promote a holistic view of the performance of whole system as well as its parts	Hardi and Zdan (1997); Bossel (1999); Martin and Odell (1996); Gallopín (1997); Hardi (1997); OECD (2005); Phillis and Andriantiatsaholiniaina (2001); Figueiredo (2003); Veleva and Ellenbecker (2001)
	Content of each level	Define content of each system level	Measure environmental, social and economic dimensions Measures deployed from sustainability vision and concept Measure current performance as well as its trends Limited number of measures focused on key issues	Hardi and Zadan (1997); Bossel (1999); OECD (2005), Gallopín (1997), Commission on Sustainable Development (2002); Hardi (1997); Bellen (2005); Figueiredo (2003); Veleva and Ellenbecker (2001); Allenby and Graedel (2002)
	Scope	Define measurement time horizon and scope	Measures short- and long-term issues Measures local and global impacts	Hardi and Zdan (1997); Bossel (1999); Kleebe *et al.* (2003); Allenby and Graedel (2002); Hardi (1997); Bellen (2005)
	Data	Define data to be collected – type (qualitative or quantitative) and aggregation level	Uses quantitative measures Compare current levels with targets	Hardi and Zdan (1997); Parris and Kates (2003); Phillis and Andriantiatsaholiniaina (2001); Veiga (2005); Figueiredo (2003)
III – Process	Interface	Define how data will be displayed (interface) considering: complexity, openness, type of interface and learning potential	Show results in a simple, clear, meaningfully and easy to understand way Accessibility to calculation approach and row data	Hardi and Zdan (1997); Bossel (1999); Bellen (2005); Hilson and Basu (2003); Gallopín (1997); Commission on Sustainable Development (2002), Kleebe *et al.* (2003); Allenby and Graedel (2002); Figueiredo (2003)
	Broad participation	Validate data and interface with decision-makers Define targets with decision-makers Establish action plans with decision-makers to achieve targets	Ensure participation of decision-makers and stakeholders Targets and action plans defined with decision-makers	Hardi and Zdan (1997); Bossel (1999); Bellen (2005); Gallopín (1997); Hardi (1997); Figueiredo (2003); Veleva and Ellenbecker (2001)
IV – Capacity for continuous assessment	Capacity for assessment	Assign responsibility of routines to collect, collate, calculate, share and support the assessment process Assess target's achievement Define corrective actions in case of target's non-achievement Review indicators, policies, targets and actions	Flexibility to easily change indicators, policies, targets and actions Routine to support the assessment process Routine to analyze results and define corrective actions	Hardi and Zdan (1997); Hilson and Basu (2003); Commission on Sustainable Development (2002); Bossel (1999); Hardi (1997); Figueiredo (2003); Veleva and Ellenbecker (2001)

Source: The authors

Appendix 1: Process of creating a sustainability measurement system (Delai & Takahashi, 2011)

Perspectives in the balanced scorecard ⇓ **Cascading**	**SUSTAINABILITY** (integrates compliance, pollution control and prevention, eco-efficiency, eco-innovation, and (eco)-ethics) *What are the environmental, social, and related economic aspects from/for sustainability that the company focuses on and that are subject to measurement?*	**STAKEHOLDERS** *How can sustainability be considered and measured in a way that suits internal and external stakeholders?*	**PROCESSES** *Which internal and external processes should the company level focus on and measure to achieve sustainability?*	**LEARNING** *What learning aspects and innovation skills should the company focus on and measure?*
CORPORATE (multiple businesses with one or more sectors or business units) Users: board, corporate advisory committee, etc.	**Triple bottom line governance** • Achieve clear commitment on strategic objectives regarding environmental, social, and related economic issues at corporate level • Comply with triple bottom line international, national, and sectorial agreements/codes **Environment / social** • Apply precautionary principle[1] • Apply carrying capacity principle (no degradation) • Aim at the achievement of zero emissions[2] • Achieve high levels of dematerialization within a life-cycle perspective (4<FX<50)[3] • Make significant substitutions (e.g., use of abundant renewable resources)[4] • Achieve in-house and external justice (equity) **Related economic/financial** • Integrate externalities that currently are not reflected in the price of products/services • Account for environmental and social financial costs and benefits (e.g., percentage turnover in sustainable business)	**Business ethics/human rights** • Define policies/systems on ethical business (e.g., merger and acquisitions takes account of social and environmental aspects; fair trade; non-discrimination; consideration of small shareholders) • Avoid bribery and corruption (e.g., within framework of integrity management system) • Attract social/ethical shareholders (e.g., measure retention rate of socio/ethical shareholders) **Labor practices** • Maintain transparency to, dialogue with, and integrate concerns of workers (e.g., worker representation in decision-making) **Society** • Attend to corporate citizenship • Guarantee stakeholder participation in decision-making	**Management** • Apply backcasting[5] for strategy development • Create sustainability corporate reports[6] • Implement a sustainability management system (cf., SIGMA Project) **Technologies/tools** • Apply triple bottom line management tools at corporate level (e.g., balanced scorecard; supply chain management; integrated information system) • Use renewable resources and environmentally compatible technologies (e.g., wind energy) • Create new products/services and businesses (focus on, e.g., substitution of toxics; going from commodities to services[4])	**Synergy** • Define policies for lifelong training and human resources management at all organizational levels • Encourage internalization of sustainability values by corporate employees **R&D** • Maintain network to promote in-house and external synergy in environmental and social issues (e.g., sector agreements)
BUSINESS (or company, site, facility) Users: managing director, etc.	**Triple bottom line governance** • Hold senior manager (with adequate human and financial resources) responsible for sustainability **Environment/social** • Institute accounting for efficiency of use of materials and resources within life-cycle perspective • Institute accounting for socio-economic and environmental impacts of processes and products/services within life-cycle perspective **Related economic/financial** • Account for in-house and outside externalities[6] within life-cycle perspective	**Labor practices** • Guarantee quality of employee contracts • Guarantee participation/satisfaction of workers (e.g., worker representation in decision-making) **Society** • Contribute to local business network and conflict resolution • Maintain good relations with external stakeholders (e.g., local community policy; number of non-governmental organization complaints resolved)	**Management** • Maintain adequate sustainability management system at business level • Make reports per business/site **Technologies/tools** • Apply triple bottom line management tools at business level (e.g., industrial ecology) • Implement social standards (e.g., AA 1000, SA 8000) • Apply integrated performance evaluation processes	**Synergy** • Improve motivation /empowerment (measure, e.g., absenteeism) • Transfer environmental know-how between businesses (e.g., meetings; workshops) **R&D** • R&D for innovation,[7] including application of precautionary principle
DEPARTMENT (finances, human resources, community affairs, legal, R&D, quality, procurement and purchasing, environmental, production, etc.)	**Triple bottom line actions** • Reduce local environmental pressure and improve socio-cultural and socio-economic performance • Monitor current status and response actions within life-cycle perspective • Identify and improve innovations (e.g., source reduction; health and safety) per department • Monitor externalities and in-house cost of measures	**Customers/suppliers** • Implement systems for improving customer/supplier satisfaction (e.g., advertising policy) **Workers** • Implement health and safety and ethical systems and worker representation in decision-making	**Management** • Integrate impact indicators into various procedures (e.g., in product costing; product design) • Apply (if applicable) take- back provisions[7] • Apply (if applicable) conservation and restoration measures	**Synergy** • Improve synergy within departments (e.g., exchange data) • Implement specific operational training for workers

Appendix 2: Sustainability Cascading Balanced Scorecard (Dias-Sardinha, 2002)